sierra monitor corporation

MODEL 5100-XX-IT

IT Series

TOXIC GAS SENSOR MODULE

Version 3.00A

FM

APPROVED

APPLICABILITY & EFFECTIVITY

Effective for all Model 5100-XX-IT Modules manufactured after June 1 2015.

5100-03-IT
5100-04-IT
5100-05-IT FM Approved
5100-06-IT
5100-08-IT
5100-10-IT
5100-12-IT
5100-15-IT
5100-21-IT
5100-25-IT
5100-26-IT
5100-88-IT

Instruction Manual Part Number T12020
Rev. D2

FM PERFORMANCE APPROVAL

ONLY THE FOLLOWING ITEMS, FUNCTIONS AND OPTIONS ARE FM* APPROVED

Model 5100-05-IT Hydrogen Sulfide Gas Sensor Module

Sensor Module

Model 5100-05-IT	Sensor Module - Hydrogen Sulfide

Calibration Equipment

Model 1250-01	Gas Sensor Calibration Kit, Type A
Model 1260-05	Hydrogen Sulfide in N2, 25 ppm Gas Cylinder
Model 1260-45	Hydrogen Sulfide in N2, 10 ppm Gas Cylinder
Model 5358-01	Calibration Adapter

Notes:

1) Apparatus must be installed in accordance with National Electrical Code.

2) FM Comments

*FM Approvals, a subsidiary of FM Global

- Project# 3034435

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1. PRODUCT DESCRIPTION

1.1 GENERAL

The Model 5100-XX-IT Toxic Gas Sensor Module is a smart transmitter and member of the IT Series family and it offers a broad array of features including:

CAUTION: THIS AREA MUST BE KNOWN TO BE FREE OF FLAMMABLE CONCENTRATIONS PRIOR TO OPENING THIS HOUSING
CAUTION: READ AND UNDERSTAND INSTRUCTION MANUAL BEFORE OPERATING OR SERVICING
M
E
CLASS 1, DIVISION 1
GROUPS B, C & D
MAX. AMB. TEMP. 50°C
10VDC - 30VDC
H_2S
SIL-2 CERTIFIED
FM
C US
APPROVED

- Integral alphanumeric LED display
- Up to 180 day calibration frequency
- FM Approval for performance and safety
- SIL-2 Certified
- Optional integral alarm relays (3)
- 4-20 mA output
- Modbus® RTU interface
- SMC Sentry interface
- Optional HART interface
- 316 Stainless steel enclosure option
- Remote sensor option
- Low maintenance and operation costs
- ATEX Approval (5100-05-IT)

The 5100-XX-IT is designed and approved for installation and operation in hazardous locations.

Members of the 5100-XX-IT Series Toxic Gas family include:

- 5100-03-IT Oxygen Gas Sensor Module
- 5100-04-IT Carbon Monoxide Gas Sensor Module
- 5100-05-IT Hydrogen Sulfide Gas Sensor Module
- 5100-06-IT Chlorine Gas Sensor Module
- 5100-08-IT Chlorine Dioxide Gas Sensor Module
- 5100-10-IT Sulfur Dioxide Gas Sensor Module
- 5100-12-IT Nitrogen Dioxide Gas Sensor Module
- 5100-15-IT Hydrogen Sulfide Gas Sensor Module
- 5100-21-IT Hydrogen Chloride Gas Sensor Module
- 5100-25-IT Ammonia Gas Sensor Module
- 5100-26-IT Hydrogen Fluoride Gas Sensor Module
- 5100-88-IT Carbon Dioxide Gas Sensor Module

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1.2 PRODUCT CONFIGURATION

Various module mounting configurations can be implemented without special fixtures. Where applicable, these options are factory configured prior to shipment. Mounting configuration can be selected by the installer or field technician and are fully described in this manual. Sensor must always be oriented downward.

1.3 THEORY OF OPERATION

Electrochemical sensors are fuel cell-like devices consisting of an anode, cathode, and electrolyte. The components of the cell are selected so a subject gas, allowed to diffuse into the cell, will cause a chemical reaction and generate a current. The cells are diffusion limited so the rate the gas enters the cell is solely dependent on the gas concentration. The current generated is proportional to the rate of consumption of the subject gas in the cell.

Sierra Monitor electrochemical sensors provide improved reliability by allowing the gas to diffuse into the sensor through a capillary port, rather than diffusing through membranes. The result is an extremely stable sensor with very low temperature and pressure coefficients and the capability to monitor gas as ppm.

1.4 MODES OF OPERATION

1.4.1 SENTRY INTERFACE

IT gas sensor modules can be installed on Sierra Monitor Sentry Model 5000 controllers Ver. 6.XX MFD after 9/1/95. When it is installed in a Sentry system the IT module must have a unique address which can be established by setting an address between 1 and 8 on the Module Address Switch accessible from the cover plate as illustrated in Figure 4-2. Figure 4-7 in this manual provides the wiring terminations for connections to the Sentry controller.

> Note 1: The Model # 5100-88-IT CO2 gas sensor module range is 0-5000 ppm. Therefore, the Sentry Controller must be configured for a 0-100 % full scale input. The Sentry does not have the ability to display engineering units up to 5000. The alarm set points need to be set as a percentage of full scale. Example, a 2500 ppm alarm set point is equal to 50% scale.

When the module is operated in conjunction with a Sentry controller, the alarm relay setup (See section 5.3) should be set to “Sentry”, allowing the Sentry controller to manage alarm relay action rather than the 5100-XX-IT Gas Sensor Module.

1.4.2 MODBUS OPERATION

An RS-485 Modbus RTU serial interface allows direct connection to standard PLCs and DCSs. The Module Address Switch (section 4.5) allows the user to select up to 15 different Modbus addresses. Also, an additional 254 Modbus addresses are available via menu selection. Figure 4-7 in this manual provides the wiring terminations for Modbus connections. The 5100-XX-IT provides the wiring terminations for Modbus connections.

1.4.3 ANALOG OPERATION

The analog 4-20 mA interface allows direct connection to standard controller and distributed system. The module is an active current source.

The standard configuration is set up for a 3-wire non-isolated connection. An optional 4-wire isolated connection is also available and can be enabled by changing JP1 and JP2. (Figure 4.6)

1.4.4 REMOTE SENSOR (APPENDIX D)

The Remote Sensor option can be used to remotely mount some sensors up to 15’ from the transmitter (refer to Appendix D for allowable distances).

1.4.5 HART CONNECTION (APPENDIX F)

A HART interface option is available. Refer to Appendix F for information.

1.4.6 REMOTE ALARM RESET

An input is available for connection of remote alarm reset. Figure 4-8 provides the wiring termination for connecting the remote alarm reset. This only resets local alarms, not Sentry alarms.

1.4.7 OPTIONAL INTEGRAL RELAYS

The optional relays are integral to the gas sensor module and are rated as SPDT, 250VAC, 5 Amps* for the High Alarm and Low Alarm relays and SPDT, 250 VAC, 0.25 Amp for the Trouble relay.

* HART option alarm relays are all SPDT, 250VAC, 2 Amp

If the gas sensor module is provided with the optional relays, it will include Terminal P4 on the interface board (Figure 4-3 and 4-4). Relay output connections are on P4.

1.5 MECHANICAL

The sensor module is comprised of the following three primary components:

- **ENCLOSURE**

  Standard on the 5100-XX-IT is an explosion-proof, rain-tight cast aluminum electrical housing (Figure 1-3) with three ¾" FNPT conduit hubs. The 5100-XX-IT-S has a 316 Stainless Steel enclosure (Figure 1-2). Both enclosure covers have a viewing window.

- **TRANSMITTER ELECTRONICS**

  Electronic Assembly consisting of one printed circuit board assembly mounted under a cover plate, plugged into one field termination board. Connectors for wiring for power, signal interface and alarm relays are located on the bottom of the termination board.

- **SENSOR ASSEMBLY**

  The sensor assembly includes an explosion proof housing containing the gas sensor and a wiring harness for connection to the transmitter. The sensor assembly threads into one hub of the enclosure. The exposed end of the sensor assembly is threaded to allow connection of a rain-shield or calibration gas.

1.6 INTERCONNECT WIRING

Not supplied with the sensor module, but necessary to the installation and operation is the shield cable which connects the module to its power source and controller. Before this wiring is installed it is important to read and understand the control system installation instructions to determine wiring requirements and alternatives.

1.7 POWER REQUIREMENTS

The modules operate on24 VDC power between 10 VDC and 30 VDC. Filtered, regulated DC power must be supplied from a separate source or from an approved Sentry or IT controller.

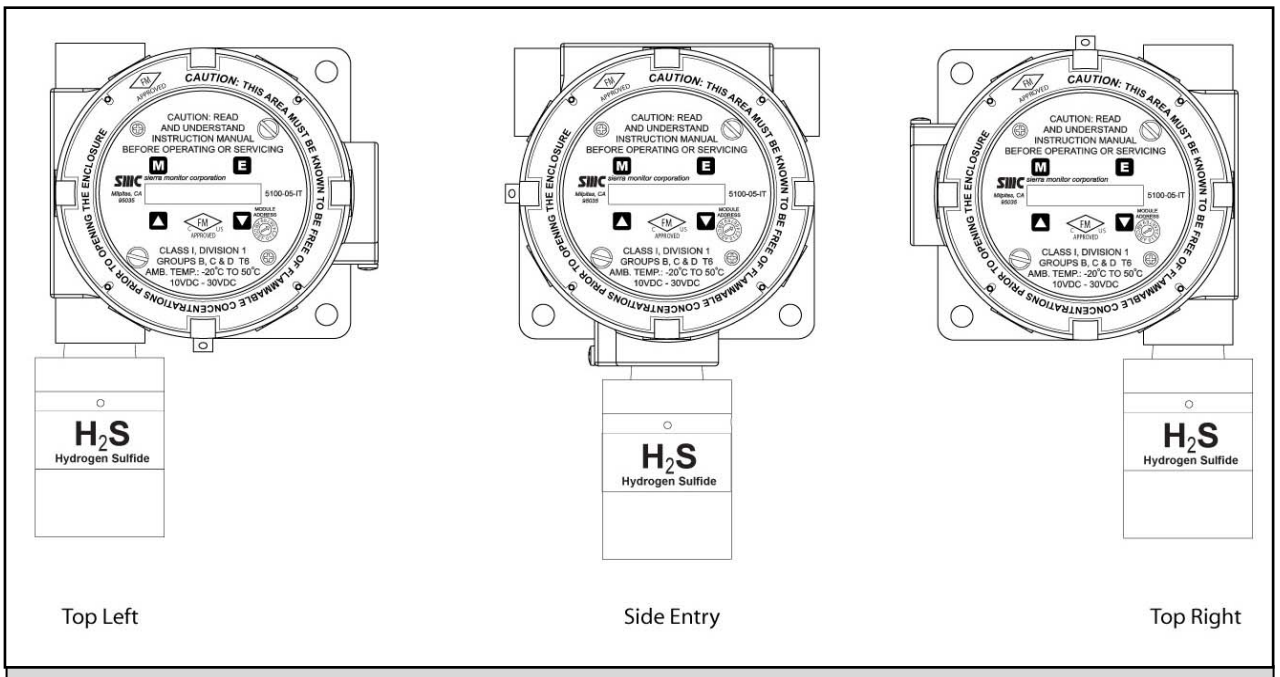

CAUTION: THIS AREA MUST BE KNOWN TO BE FREE OF FLAMMABLE CONCENTRATIONS PRIOR TO OPENING THE ENCLOSURE
CAUTION: READ AND UNDERSTAND INSTRUCTION MANUAL BEFORE OPERATING OR SERVICING
5100-05-IT
CLASS I, DIVISION 1 GROUPS B, C & D T6 AMB. TEMP.: -20°C TO 50°C 10VDC - 30VDC
H2S
Hydrogen Sulfide
Top Left
Side Entry
Top Right

Figure 1 - 1: Model 5100-XX-IT Toxic Gas Sensor Module – Mounting Options

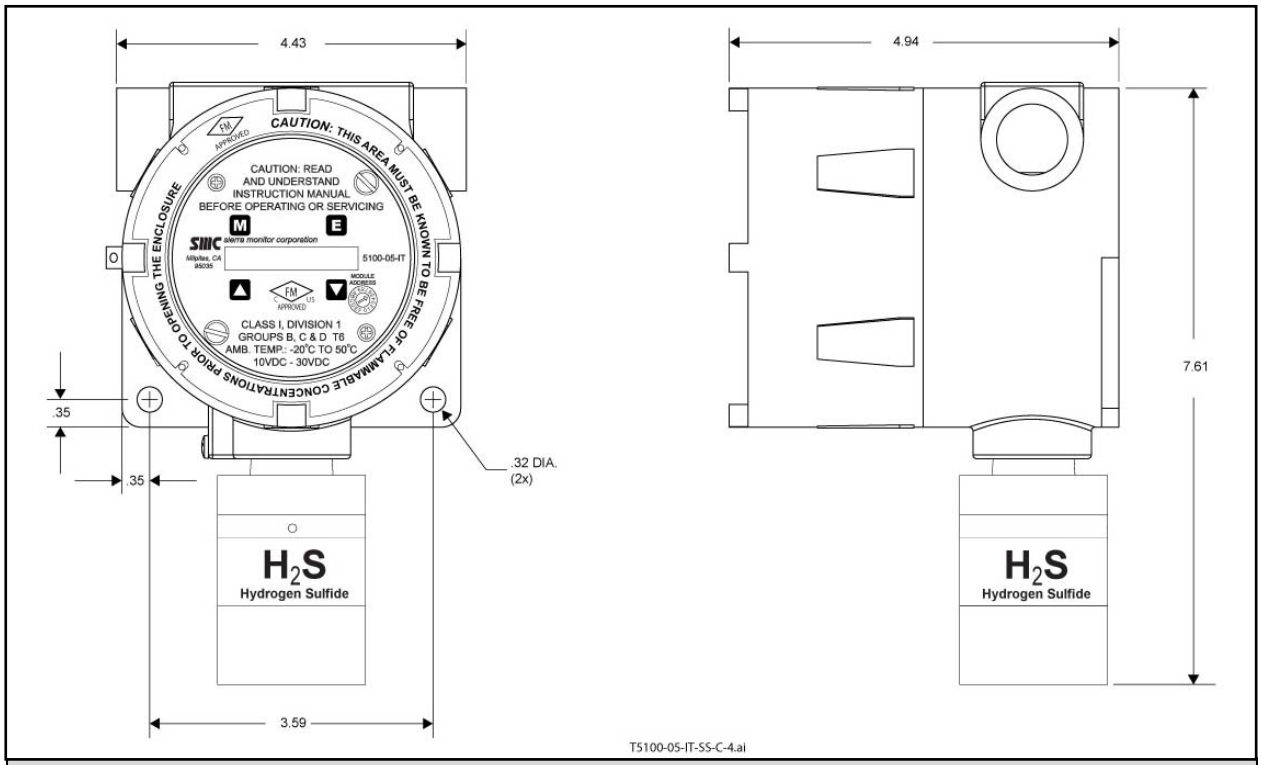


Figure 1 - 2: Model 5100-05-IT-S1 (and S2) Toxic Gas Sensor – Stainless Steel Enclosure, Dimensions
(Valid for all except 5100-25/26-IT – See Appendix G)

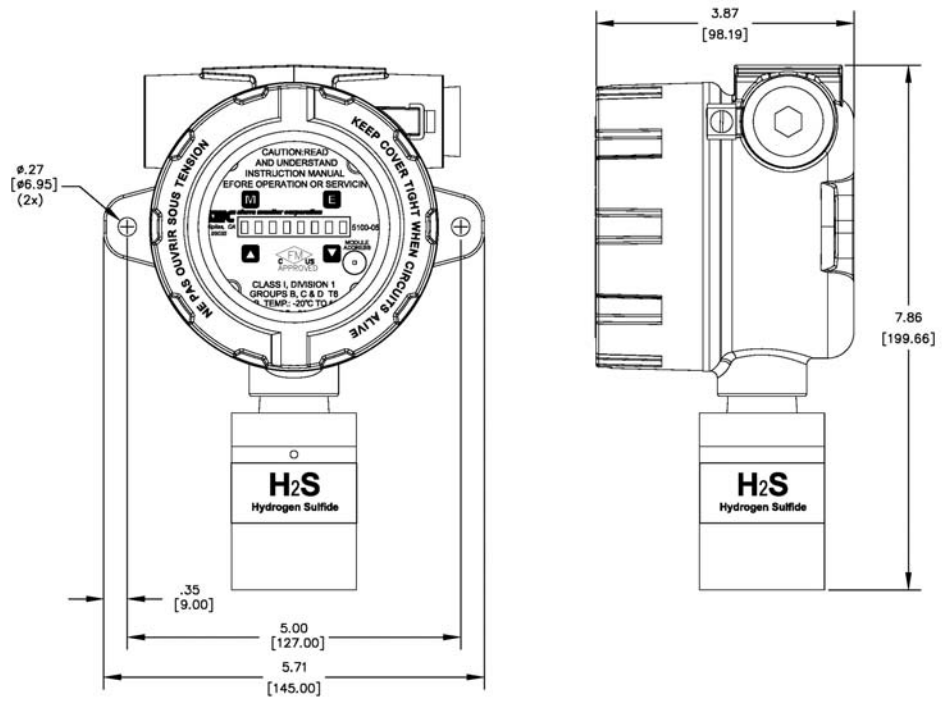


Figure 1 - 3: Model 5100-05-IT-A1 (and A2) Toxic Gas Sensor – Cast Aluminum Enclosure, Dimensions
(Valid for all except 5100-25/26-IT – See Appendix G)

NOTE
Module installation must be such that it is mounted vertical with sensor pointing downward.

2. CAUTIONS & WARNINGS

2.1 INTRODUCTION

Although the IT Transmitter Modules are designed and constructed for installation and operation in industrial applications including "hostile" environments, caution should be taken to insure that the installation is made in compliance with this instruction manual and that certain procedures and conditions are avoided. This chapter discusses the necessary cautions. **Read the entire chapter prior to installation of the equipment.**

2.2 GAS SENSOR MODULES - GENERAL

Avoid installing sensor modules where they will be unnecessarily exposed to wind, dust, water (i.e. direct hose down), shock, or vibration. Observe temperature range limitations.

Sensors may be adversely affected by prolonged exposure to certain materials. Loss of sensitivity, or corrosion, may be gradual if such materials are present in low concentrations. These materials include: Halides (compounds containing chlorine, fluorine, bromine, iodine), acid vapors, caustic liquids or mists.

Care has been taken by the manufacturer to ship modules in protective packaging to avoid contamination prior to installation. It is recommended that the modules remain protected during installation and that the covering be removed immediately prior to system start-up.

During normal use the O_2, CO, H_2S, and SO_2 sensors are protected from dirt and oil contamination by a sintered metal cover. If this cover becomes clogged, the response of the sensor will be reduced. Protect the sensor from contamination by careful placement, or by use of rain shields and dust shields.

Sensor modules must not be painted. Paint may contain compounds which will contaminate the sensor. Paint will cause clogging of the sintered metal cover and will cause difficulties during attachment of the calibration head or other maintenance activity. It is recommended that the module be tagged **"DO NOT PAINT"**.

2.3 WIRING

The manufacturer recommends that extra caution be taken where the installation is near any sources of electromagnetic or radio frequency interference. Precautions include:

- Avoid running sensor module cable close to high power cables, radio transmission lines, or cables subject to pulses of high current.
- Avoid running cables near large electric motors or generators.
- When the sensor module is to be operated in analog (4-20mA output) mode shielded cable is required.
- When shielding is used, it is recommended that shields be grounded at the controller and nowhere else.
- All splices must be via either a termination hardware system or soldered. Improperly spliced cable can result in corrosion, resistance changes and system errors. The use of wire nuts and crimp-on connectors is unacceptable.

NOTE
Installation and wiring must be in accordance with the National Electrical Code. Voltage AC conductors are not to be run in the same conduit as voltage DC conductors.

2.4 CALIBRATION FREQUENCY

The 5100-XX-IT calibration frequency is six months (180 days). However, prudent gas detector maintenance practices normally suggest a simple recalibration following incidences of exposure to high levels of gas that would lead to alarm activation within any system utilizing the output of the gas sensor module.

3. QUICK START

3.1 OVERVIEW

The gas sensor module has been supplied factory calibrated and ready for immediate installation and operation. An installer familiar with installation and operation of gas detection products can use this section to begin immediate use of the module.

3.2 WIRING

See section 4.2 to determine if 3-wire or 4-wire operation is necessary.

Provide two conductor twisted shielded wiring from the power supply/control device to the sensor module location. Use wire that is 18 AWG or larger.

3.3 MODULE INSTALLATION

The sensor can be mounted in a variety of configurations supported by the conduit. See figure 1-3 to determine which configuration is best for your specific application. The default configuration enables the modules to be put in line with other modules with the sensor element below the transmitter. To change the configuration simply remove the transmitter and rotate to the appropriate configuration and remount the standoffs and transmitter.

The module is designed to be installed on a ¾" NPT or M20 conduit. Two important warnings:

- **The installation must meet any hazardous environment codes for electrical equipment.**
- **The sensor module enclosure mounting must be spaced far enough from any vertical surface to allow removal and replacement of the sensor assembly which is threaded into one ¾" conduit entry.**
- **Sensor housing must be oriented vertically pointing downward.**
- **If module is installed outdoors it is recommended that it be sheltered from direct sunlight.**

3.4 TRANSMITTER INSTALLATION

To install the transmitter printed circuit assembly into the housing, carefully turn the faceplate so that the printing is in the correct horizontal position for the mounting configuration and slide the assembly over the two stand-offs in the enclosure.

Hand tighten the two captive panel thumb screws into the stand-offs. Replace the enclosure cover prior to providing power to the transmitter

- **If the transmitter is installed in a classified hazardous area, replace the threaded cover prior to providing power.**

3.5 START-UP & OPERATION

To begin operation of the sensor module activate the instrument loop with 10-30 VDC. Each time the sensor module is powered up it will perform a warm-up for approximately 1.0 minutes (60 seconds). During this time the display will read "Starting". The loop output will be held at 4 mA.

NOTE: If the sensor is uncalibrated, the startup display will state "UNCALIB" instead of "STARTING"
NOTE: The 5100-06-IT, 5100-08-IT, 5100-25-IT, 5100-26-IT and 5100-88-IT require 300 seconds warm-up period

After the warm-up period has expired, the display will indicate the gas concentration. Also, the instrument loop will be released to output current in the range of 4 to 20 mA. The actual current is linear with the gas concentration and depends on the selected range. For instance, when the range of 0 to 50 PPM has been selected, a current of 4 mA corresponds to 0 PPM and a current of 20 mA corresponds to 50 PPM.

3.6 ZERO STABILIZATION

All electrochemical sensors require at least 30 minutes on power prior to calibration. This allows the electrode potentials to equilibrate, resulting in a stable zero signal level.

4. INSTALLATION

4.1 SENSOR MODULE LOCATIONS

NOTE
All IT modules are factory pre-configured and calibrated.
All modules are tagged to indicate the configuration including the sensor module number
Identify all components during unpacking and install using the factory configuration.

The gas sensor module utilizes a diffusion type sensor which should be located close to either the expected source or destination of the gas hazard. If the gas is heavier than air, the sensor module should be installed within 24 inches of the ground or floor. If it is lighter than air, move it above 6'.

After optimum locations are determined based on the above recommendations, consideration should be given to placing the sensor modules in locations which are accessible for calibration service. Slight adjustments to the location of the sensor module may have little impact on effectiveness but major effect on accessibility.

- Modules should be placed close to the potential source of gas.
- Modules should be placed in areas accessible for calibration.
- Sensors should be pointed down and the conduit should include an inverse trap to reduce moisture (condensation) from accumulating in the electronics enclosure.
- Remote calibration fitting (5360-00) should be used to facilitate calibration gas delivery. Run polyurethane tubing (1/4" O.D. x 1/8" I.D.) from fitting to an accessible location.

Model	Gas	Gas Density
N/A	Air	1.00
5100-04-IT	CO	0.97
5100-05-IT	H_2S	1.19
5100-06-IT	Cl_2	2.49
5100-08-IT	ClO_2	3.09
5100-10-IT	SO_2	2.26
5100-12-IT	NO_2	2.12
5100-15-IT	H_2S	1.19
5100-21-IT	HCl	1.27
5100-25-IT	NH_3	0.60
5100-26-IT	HF	1.86
5100-88-IT	CO_2	1.53

Table 4 - 1: Specific Gravities

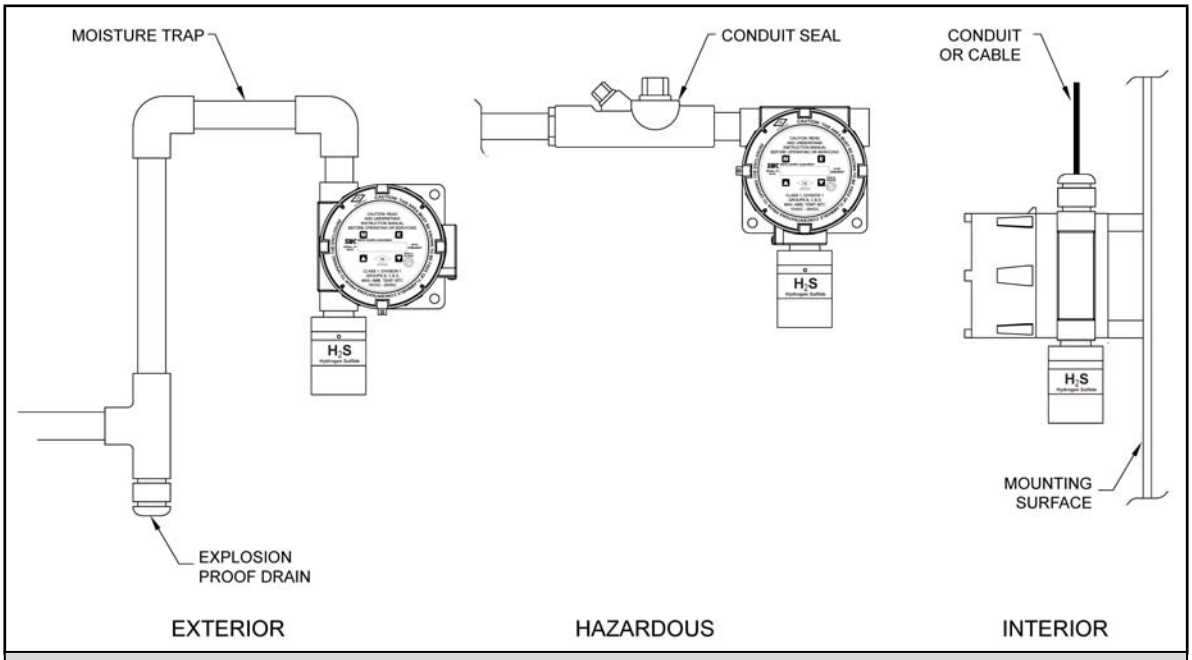


Figure 4 - 1: Typical Mounting Options

4.2 WIRING

4.2.1 ANALOG 4-20 mA OPERATION (Figure 4-6)

For a 3-Wire non-isolated connection, set jumpers, located on the bottom of the transmitter board, to the lower position as illustrated in Figure 4-6. Verify that both jumpers are in the position marked by 3-wire. When using a 3-wire connection, a minimum of an 18 AWG, 3 conductor shielded cable must be used. A cable shield must never be used as a conductor. Larger gauge wire is recommended with distances over 1000'. Connect wires as shown in figure 4-4.

For a 4-Wire isolated connection, set jumpers, located on the bottom of the transmitter board, to the upper position as illustrated in Figure 4-4. Verify that both jumpers are in the position marked by 4-wire. When using a 4-wire connection, a minimum of 2 each of an 18 AWG, 2 conductor twisted/shielded pair cable must be used. A cable shield must never be used as a conductor. Larger gauge wire is recommended with distances over 1000'. Connect wires as shown in figure 4-4.

4.2.2 MODBUS OPERATION USING RS-485 CONNECTION

Use a minimum of 18 AWG, 2 conductor for DC power connection. No shield required. In addition use a minimum of 24 AWG, low capacitance, shielded data cable for RS485 half duplex communication. The installation may be planned in a manner which provides up to 32 sensor modules on a single home run.

Standard default RS485 Setting are: 38,400 baud, 8 bits, 1 stop bit, no parity

TERMINATION RESISTOR JUMPERS:

Termination resistors are used in RS-485 wire runs to provide impedance matching. The IT series modules use a 120 Ohm resistor for this function. The cable being used for this RS-485 connection must have a minimum of 100 Ohm impedance with a maximum of 120 Ohms.

Installations where the cable length is under 100', termination resistors may not be required. In installations where the cable length is greater than 100', it is recommended to place the termination jumpers on the first device and last device on the RS-485 wire run. Termination jumpers must be removed from all other modules connected between the first and last device. The first device in the RS-485 multiplexed bus is usually a gas controller or PLC. Factory term resistor setting is "not enabled."

BIAS JUMPERS: (BIAS A, BIAS B)

Bias resistors are used to force RS-485 receiver outputs to a known (fail-safe) state, when the bus is idle. Bias jumpers are always installed in pairs as the bias must be placed on both the TX A and TX B lines. Sierra Monitor's IT series of toxic gas sensors automatically apply the bias jumpers, and are factory installed so that the bias is always enabled.

4.2.3 SENTRY OPERATION USING SMC SENTRY CONNECTION (FIGURE 4-7)

Use a minimum of 18 AWG, 3-conductor cable up to 2000'. The cable may or may not be shielded. We recommend shielded cable in circumstances that there could be RF or EM interference present. Shield to be terminated and grounded only at the Sentry controller. Shield must be cut and dressed at the module end so that no part of it comes in contact with the conduit or ground.

NOTE
Be sure to follow all local electric code and safety requirements when installing the 5100-XX-IT Gas Sensor Module

4.2.4 GENERAL

Install conduit as required by local code or construction specifications. Provide for splice boxes where multiple modules will be wired to a single run. Pull conductors of the correct gauge wire from the controller to each splice box and from the respective splice box to each planned module location. See for proper wire termination in the splice box. Twisted wire secured with wire nuts is not an acceptable splice.

NOTES
The drain wire of shielded cable must NOT be used as one of the conductors. Installation and wiring must be in accordance with the National Electrical Code. Temperature rating of cable wire must be at least 75^{o}C. If cable runs through higher temperature environments, it must be specified for that environment.

4.3 ENCLOSURE INSTALLATION

To protect the transmitter and sensor assembly they should be removed from the enclosure and preserved until final installation and wiring termination.

Number of modules	Maximum length of wire run (feet)				
	500	1,000	2,000	3,000	5,000
1	18	18	16	16	14
2	18	18	14	12	xx
3	18	16	12	xx	xx
4	16	14	12	xx	xx

Table 4 - 2: Minimum Wire Gauges

Prior to installation and wiring:

1. Remove the transmitter from the module housing by:
   - Unscrew the two captive panel screws on the faceplate.
   - Lift the transmitter out of the enclosure.
   - Unplug the sensor cable from transmitter connector P2.
   - Remove the sensor assembly from the enclosure hub.
2. Install the module enclosure onto the end of the supply conduit and/or bolt into position as required.

NOTE
When enclosure earth grounding is required for the installation a grounding lug is located in the base of the enclosure. Install the earth ground under the green ground screw.

4.4 TRANSMITTER AND SENSOR INSTALLATION

When all pre-wire is complete:

1. Install sensor assembly in the open hub on the module enclosure. The sensor assembly thread must be fully seated into the hub and tightened to maintain explosion proof assembly.
2. Connect the wires which return to the controller to interface board connectors P1, P2, P3 and P4 according to Figure 4-3 and Table 4-4 and as detiled in the connector tables below.
3. Connect the sensor assembly cable to top transmitter board connector P2.
4. Align the headers between the top transmitter board and the lower interface board and push together.
5. Turn rotary switch to correct sensor address if required.
6. Carefully return the transmitter to the enclosure installing it over the two stand-off's. Tighten the retaining screws into the stand-offs.
7. Cycle power to accept module address change.
8. Establish the module address according to section 4.5.

P1	PCB Label		Function
1	Switch	IN +	Digital Input SW +
2		IN -	Digital Input SW -
3	4-20	IN +	4-20 mA Input +
4		IN -	4-20 mA Input -
5	GND		Ground
6	4-20	OUT +	4-20 mA Output +
7		OUT -	4-20 mA Output -

P2	PCB Label		Function
1	RS 485	+	RS 485 (+) (A)
2		-	RS 485 (-) (B)
3		S	RS 485 shield (Isolated GND)
4	RS 485	+	RS 485 (+) (A)
5		-	RS 485 (-) (B)
6		S	RS 485 shield (Isolated GND)

P3B	PCB Label	Function
1	P	VDC Power
2	S	Sentry Signal or Communication
3	G	VDC Ground
P3A		
4	P	VDC Power
5	S	Sentry Signal or Communication
6	G	VDC Ground

P4 Connections are only installed only when the optional Relays are included

P4	PCB Label		Function
1	WARNING	N/C	Low Alarm Relay NC
2		COM	Low Alarm Relay COM
3		N/O	Low Alarm Relay NO
4	ALARM	N/C	High Alarm Relay NC
5		COM	High Alarm Relay COM
6		N/O	High Alarm Relay NO
7	TRBL	N/C	Trouble Alarm Relay NC *
8		COM	Trouble Alarm Relay COM*
9		N/O	Trouble Alarm Relay NO*
* Trouble relay is fail safe so it is energized for normal operation, functions are labeled for normal operation.			

NOTES

The starting delay period normally takes approximately 3 minutes but under some circumstances can take longer.

For optimum performance, it is recommended that a calibration be performed after 24 hours of operation.

4.5 MODULE ADDRESS SWITCH

For digital interface applications the module address switch (or Modbus node) Figure 4-2 must be set per Table 4-3:

POSITION	ADDRESS	POSITION	ADDRESS
1	Sensor 1	9	Sensor 09
2	Sensor 2	A	Sensor 10
3	Sensor 3	B	Sensor 11
4	Sensor 4	C	Sensor 12
5	Sensor 5	D	Sensor 13
6	Sensor 6	E	Sensor 14
7	Sensor 7	F	Sensor 15
8	Sensor 8	0	Software Menu

Table 4 - 3: Sensor Module Address Switch Positions

NOTES

For Sentry (PSG) applications only sensor addresses 1-8 are allowed. If using Modbus output sensor addresses 1-15 are available. Position 0 allows the Modbus Address to be set by software menu, in the range 16-254.

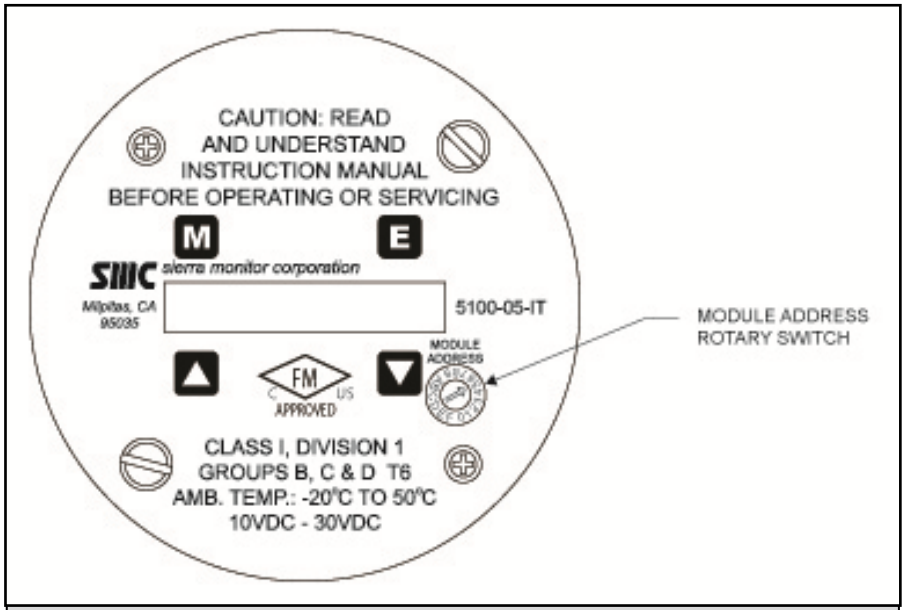


Figure 4 - 2: Transmitter Face Plate

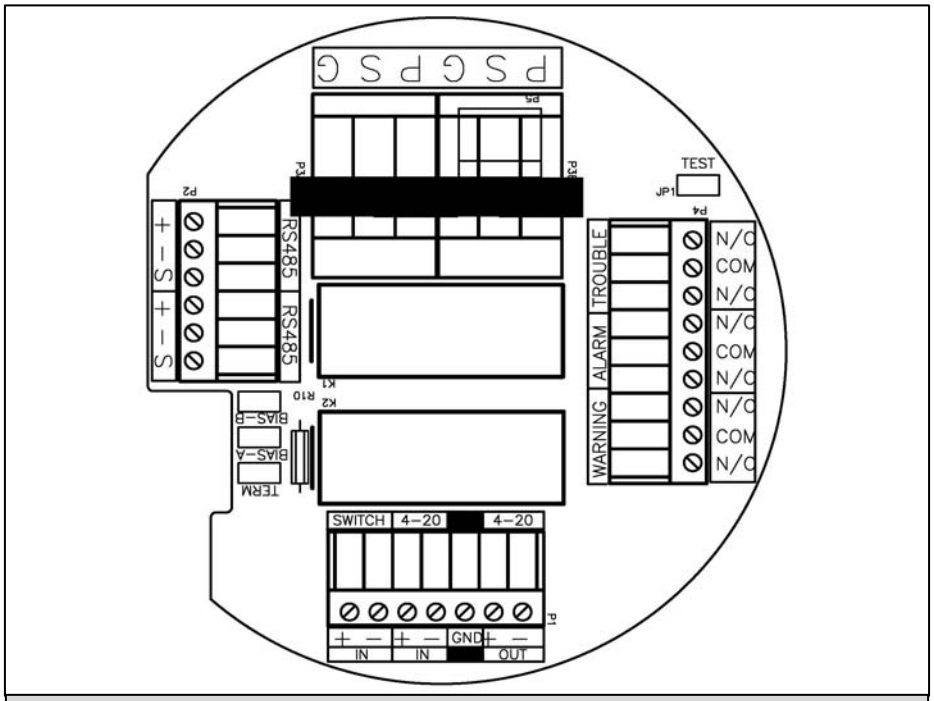


Figure 4 - 3: Interface Board Connectors

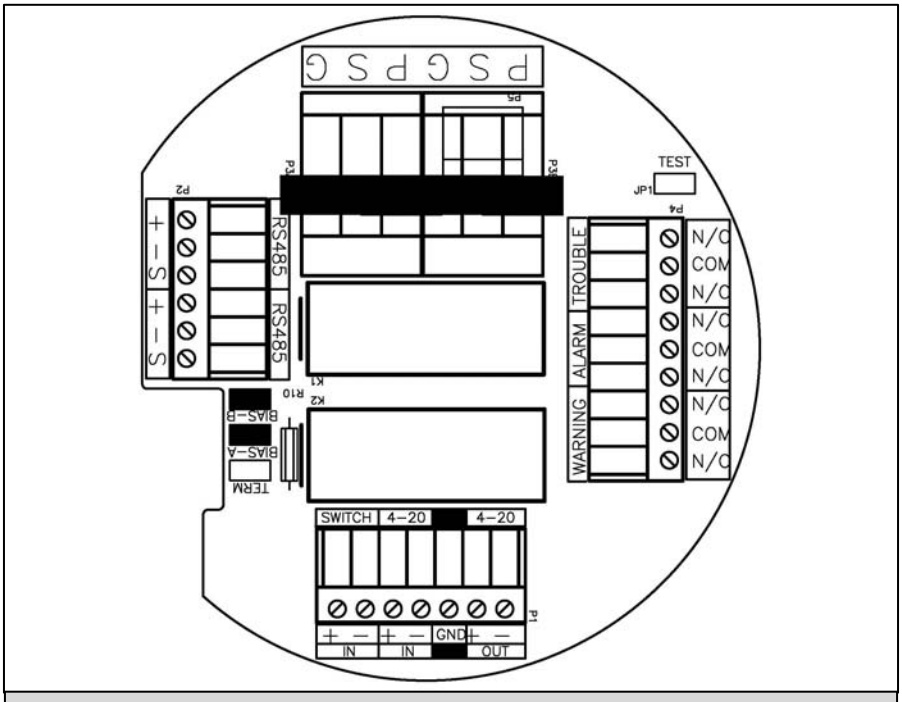


Figure 4 - 4: RS-485: Termination, BIAS Jumper

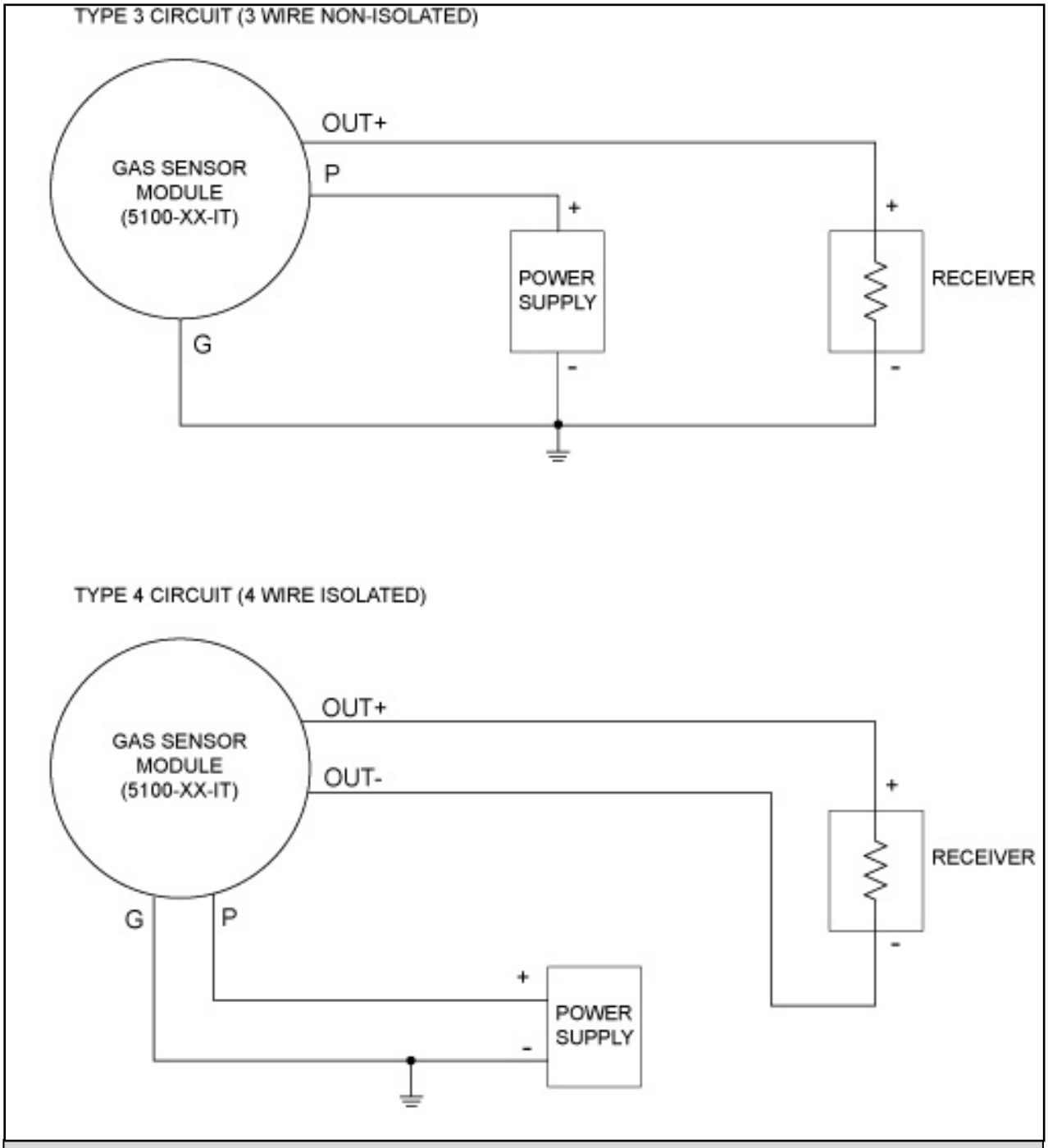


Figure 4 - 5: mA Circuit Types

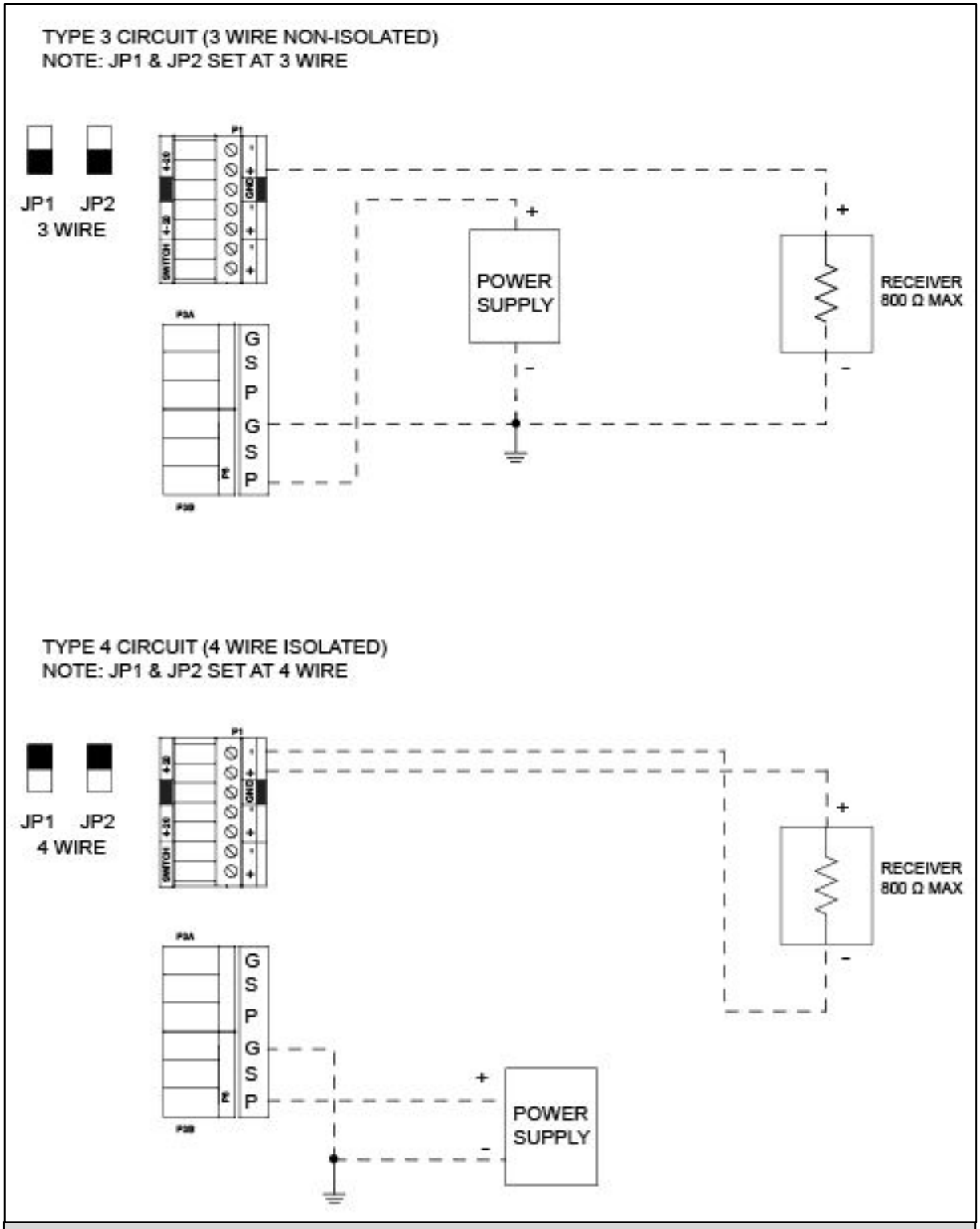


Figure 4 - 6: 4-20 mA Circuit Type Connections for 5100-XX-IT

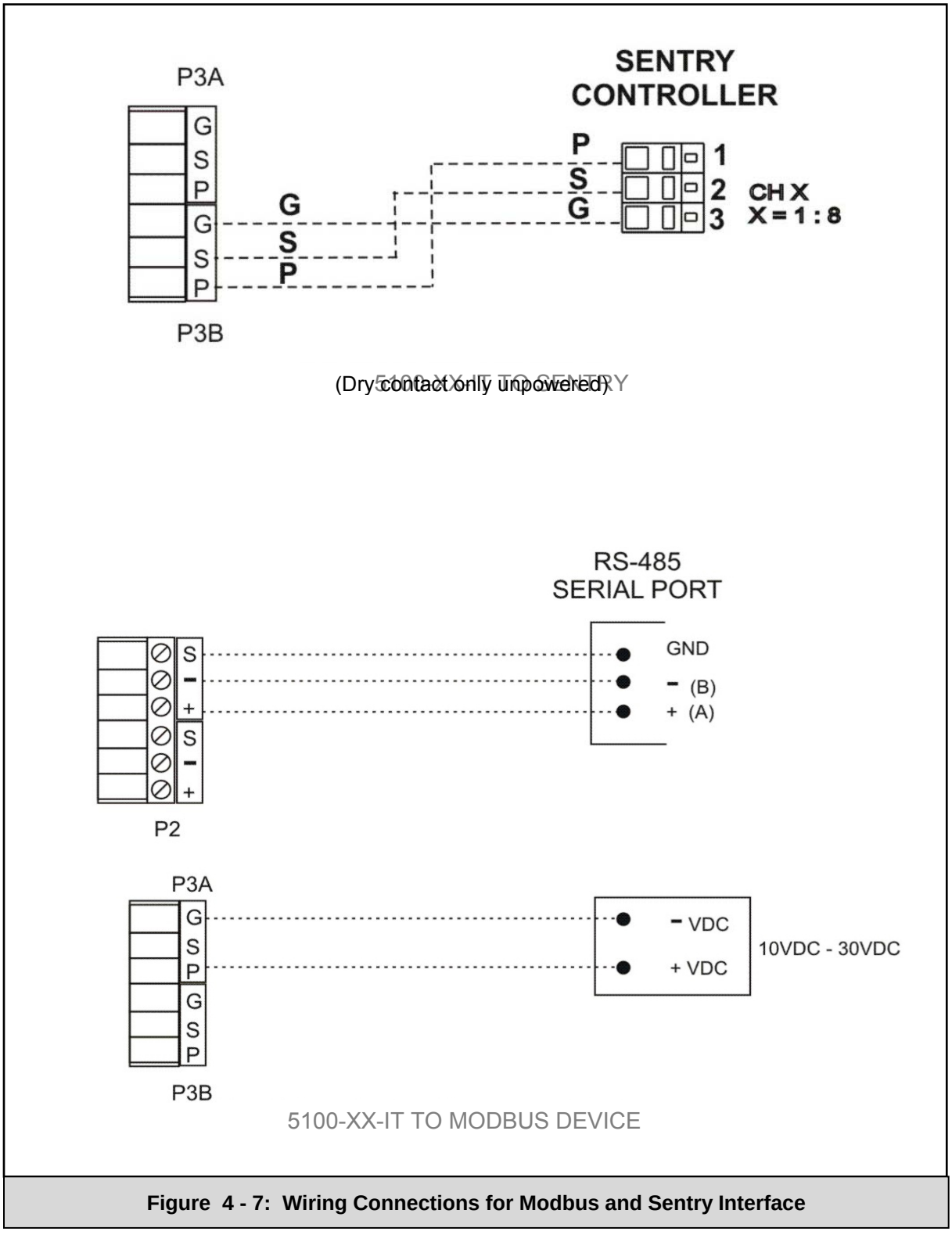
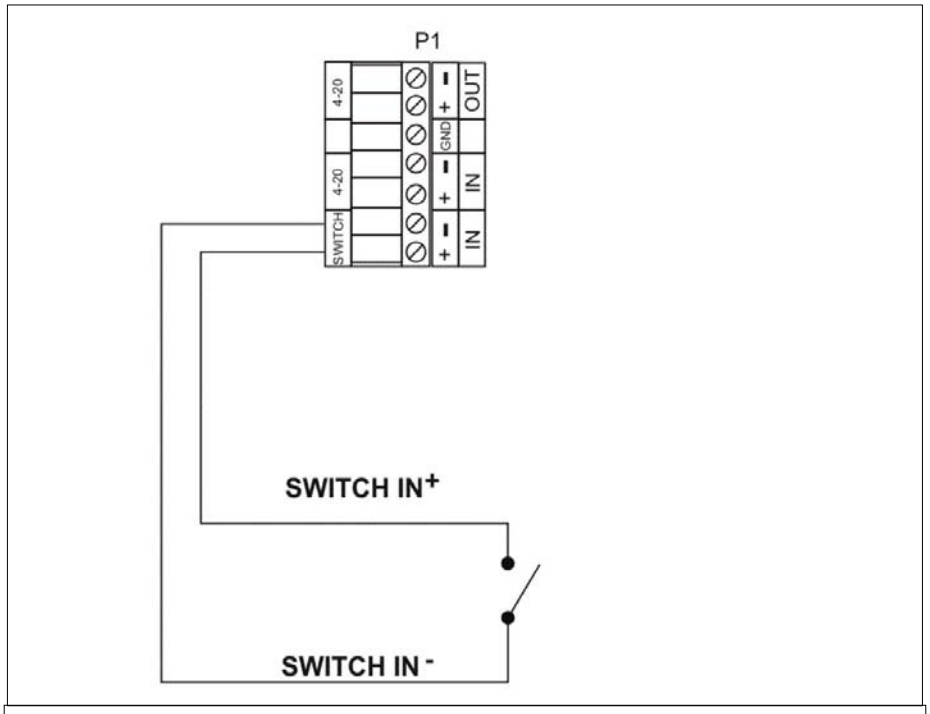
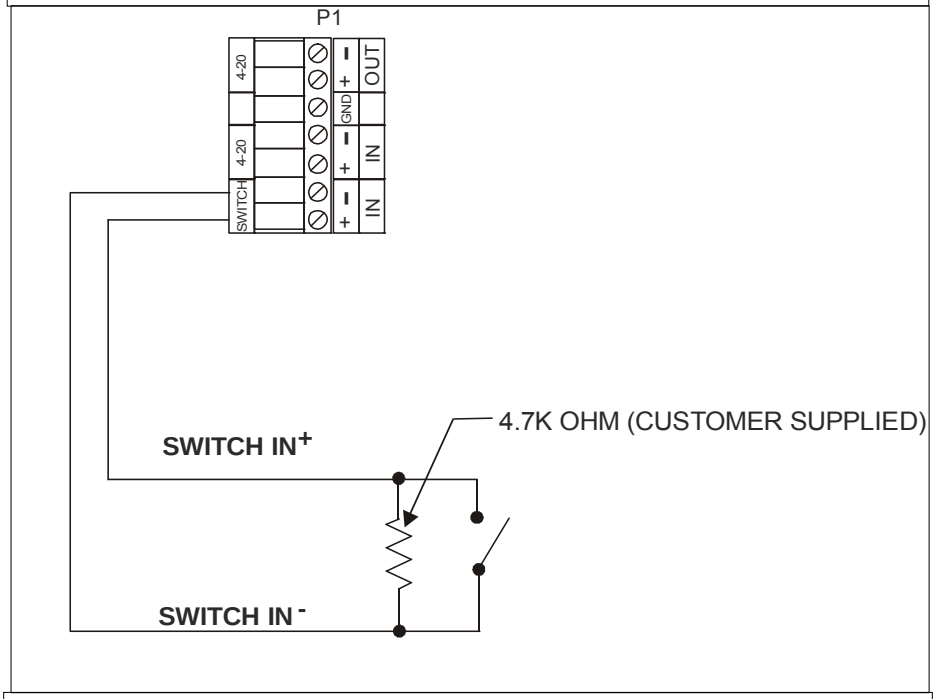


Figure 4 - 7: Wiring Connections for Modbus and Sentry Interface



5100-XX-IT Remote Alarm Reset (Unsupervised)
(Dry contact only unpowered)



5100-XX-IT Remote Alarm Reset (Supervised)

Figure 4 - 8: Wiring Connections for Remote Alarm Reset

5. OPERATION

5.1 INTRODUCTION

The Gas Sensor Module utilizes a visual menu system operated by means of a magnet. A magnetic tool (5358-50) is supplied for this purpose. The menu system is used to configure alarm set-points, calibrate the sensor module, and for maintenance procedures and alarms acknowledge.

5.2 DATA ENTRY KEYPAD

The module menu system is operated by means of directing the magnet stick toward each of four independent hall-effect magnetic switches. Each switch functions as if it is a manually activated panel key. The keys are located under the faceplate above and below the LED display and are labeled [M], [E], [▲] and [▼] as shown in Figure 5-1.

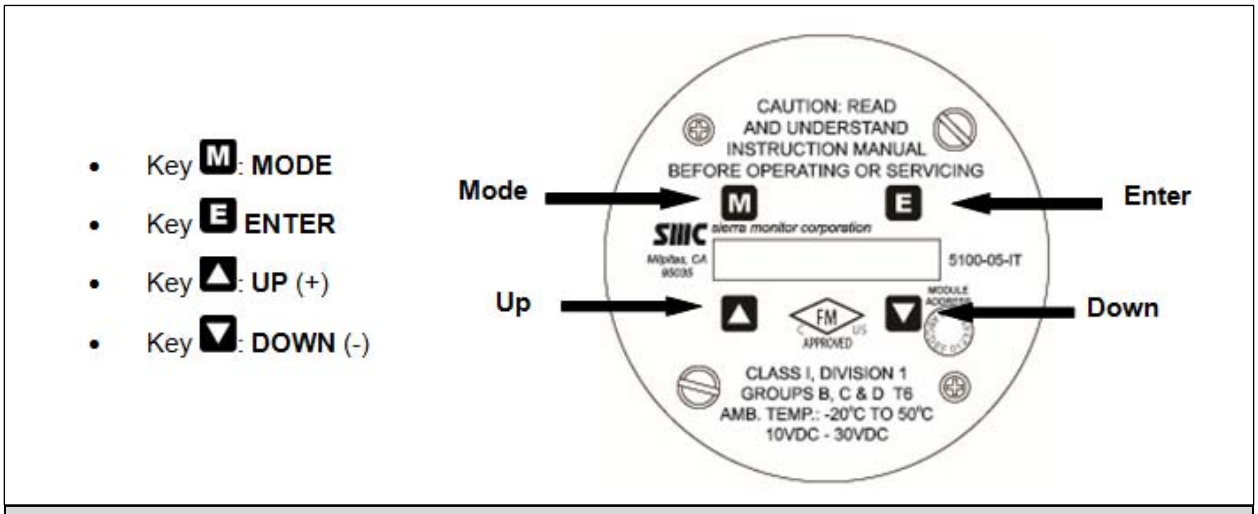


Figure 5 - 1: Face Plate with Operator Key Pad

5.3 MAIN MENU

Key	Function	Display	Description	Reference
M ▲ E ▼	Mode		Switch [M]	
M ▲ E ▼	Enter		Switch [E]	
M ▲ E ▼	Up		Switch [▲] Previous Menu	
M ▲ E ▼	Down		Switch [▼] Next Menu	
		5100-XX	First screen at power up: Model No.	
		VXX-XX--	Second screen at power up: Version No.	
		STARTING	Third screen at start up: Starting Delay	
		XXX PPM	Normal condition - default display	
M ▲ E ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
			Banner: "Press [E] to reset alarm"	
M ▲ E ▼		RESET	Alarm Reset	
		XXX PPM	Default Display	
M ▲ E ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M ▲ E ▼	Mode	CALIB:--	Mode Function - Calibrate	Table 6-1
M ▲ E ▼	Mode	SETUP:--	Mode Function - Set up alarms, relays, etc	Table 5-3
M ▲ E ▼	Mode	MAINT:--	Mode Function - Maintenance	Table 5-4
M ▲ E ▼	Mode	EXIT-?--	Exit Menu	
M ▲ E ▼	Enter	XXX PPM	Apply Selected Mode (Exit)	
		XXX PPM	Default Display (Once a minute the sensor displays module address)	

Table 5 - 1: Master Menu

Table 5-2 defines the key operational displays on the operator interface.

DISPLAY	DESCRIPTION
STARTING	Delay from loss of power at start-up
XXX PPM	Concentration
LXXX PPM	Low Alarm (Warning)
HXXX PPM	High Alarm (Alarm)
_HIGH__	Measures gas, concentration exceeds 100% of Full Scale
CXXX PPM	Calibration Mode
__ACK__	Acknowledged Function

Table 5 - 2: Operation Display Values

If display shows "Start" instead of "Starting", the module must be calibrated before using it.

5.4 SET-UP

The sensor module set-points menu is used to initially set-up the alarm set points, relay actions, gas type and range, 4-20 mA action or RS-485/Sentry address and baud rates, Digital Input and Warm-up time. Use the [▲] or [▼] keys to select following menus and press [E] to select.

- **Alarms:** Use the [▲] or [▼] keys to select Low Alarm (Warning) or High Alarm (Alarm) menu. Key [▲] will adjust the setpoint upwards and Key [▼] will adjust the value downwards. Once it reaches the desired setpoint, Key [E] will accept it and ACK will appear.

  Set-points can be configured using this menu up to the following values:

Factory Alarm Set Points		
Model	**Warning**	**Alarm**
5100-03-IT	19.5%	16.5%
5100-04-IT	50 PPM	100 PPM
5100-05-IT	10 PPM	20 PPM
5100-06-IT	2.0 PPM	5.0 PPM
5100-08-IT	0.3 PPM	1.0 PPM
5100-10-IT	10 PPM	20 PPM
5100-12-IT	2 PPM	4 PPM
5100-15-IT	10 PPM	20 PPM
5100-21-IT	5 PPM	10 PPM
5100-25-IT	25 PPM	50 PPM
5100-26-IT	2.0 PPM	5.0 PPM
5100-88-IT	1000 PPM	2500 PPM

NOTE: To enable rising O2 Alarm set warning setpoint higher than 20.9%

- **Relays:** Use the [▲] or [▼] keys to select High Alarm (Alarm) or Low Alarm (Warning) relay menu and press [E]. Use the [▲] or [▼] keys to select the correct alarm relay action for the application, Latch, Sentry or Non-Latch. Selecting "Sentry" enables the Sentry controller to make all alarm action decisions. * indicates the current selection.

- **Range:** Use the [▲] or [▼] keys to select Range menu and press [E]. When "Range" is selected menu provides any choices of ranges available for the gas type selected. Use the [▲] or [▼] keys to select the desired range. If the "User" range is selected, use the [▲] or [▼] keys to adjust the high end of the range desired.

Factory Range Set-up		
Model	**Range**	**Other Available**
5100-03-IT	5-25%	0-25%
5100-04-IT	0-500 PPM	Variable
5100-05-IT	0-100 PPM	Variable
5100-06-IT	0-10 PPM	None
5100-08-IT	0-3 PPM	None
5100-10-IT	0-100 PPM	Variable
5100-12-IT	0-20 PPM	None
5100-15-IT	0-100 PPM	None
5100-21-IT	0-20 PPM	None
5100-25-IT	0-100 PPM	Variable
5100-26-IT	0-10 PPM	None
5100-88-IT	0-5000 PPM	Variable

- **4-20mA:** Use the [▲] or [▼] keys to select Calib or CalibOut menu and press [E]. The "Calib" section of the menu allows the user to calibrate the 4 mA and 20 mA outputs. To calibrate the 4 mA and 20 mA outputs it is necessary to have an amp meter connected to the 5100-XX-IT and upon selecting the 4 mA output calibration then the [▲] or [▼] keys can be used to adjust the 4 mA reading on the amp meter until it reads 4 mA. Similar steps can then be performed for the 20 mA output. The CalibOut section allows the user to select the 4-20 mA output action desired during calibration. * indicates the current selected value. Available selections include:

- **Track –** the 4-20mA value tracks the calibration gas exposed to the gas sensor module
- **C2.50mA** – the 4-20mA value is held at 2.50mA during calibration
- **C4.00mA** – the 4-20mA value is held at 4.0mA during calibration.

- **RS-485** - Use the [▲] or [▼] keys to select Address or Baud rate menu and press [E]. Note that the 5100-XX-IT has a rotary switch on the faceplate and it is used to select addresses 1-15. When connected to Sentry the user can select 1-8 and when using Modbus RS-485 the user can select addresses 1-15. For Modbus addresses above 15, set the rotary switch to 0 and then use the "Address" menu to select any address between 16 and 254. The Baud rate menu allows the user to select a baud rate of 38400, 19200, 9600, 4800 or 2400. * indicates current selection. (Sentry default is 9600)
- **DigInput** – Use the [▲] or [▼] keys to select supervised or Non-supervised digital input and then press [E] to change.

Key	Function	Display	Description	Reference
		--0%LEL-	Default Display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M E ▲ ▼	Mode	CALIB:--	Mode Function - Calibrate	
M E ▲ ▼	Mode	SETUP:---	Mode Function - Set Point Adjustments	
M E ▲ ▼	Enter	Alarms	S.P. Function - Alarm Adjust	* A Below
M E ▲ ▼	Down	Relays	S.P. Function - Relays Adjust	* B Below
M E ▲ ▼	Down	Relays	S.P. Function - Range Adjust	* C Below
M E ▲ ▼	Down	4-20mA	S.P. Function - 4-20 mA Adjust	* D Below
M E ▲ ▼	Down	Dig Input	S.P. Function - RS-485/Sentry Output Adjust	* E Below
High Alarm Set Point Adjustment Example				
M E ▲ ▼	Enter	H.Alarm	S.P. Function - High Alarm Adjust	*A
M E ▲ ▼	Enter	HASP:60-	High Alarm Set Point: current = 60	
			Use ▲ or ▼ keys to adjust to new set point	
M E ▲ ▼	Down (x5)	HASP:55-	High Alarm Set Point: new = 55	
M E ▲ ▼	Enter	ACK	Momentary Acknowledge of new Set Point	
		H.Alarm	S.P. Function - High Alarm Adjust	
Relays Set Point Adjustment Example				
M E ▲ ▼	Enter	H. Relay	S.P. Function - High Alarm Relay Adjust	*B
M E ▲ ▼	Down	L.Relay	S.P. Function - Low Alarm Relay Adjust	
M E ▲ ▼	Enter	Latch	Use ▲ or ▼ keys to adjust to new relay action (Latch, Sentry, NonLatc) * indicates current	
M E ▲ ▼	Down	Sentry	NOTE: Sentry indicates that Sentry controls relay action and not the IT Sensor Module	
M E ▲ ▼	Down	*Sentry	Low Alarm Relay set to Sentry	

Table 5 - 3: Set-Up Configuration

Gas Range Adjustment Example				
M ▲ / E ▼	Enter	Range	S.P. Function - Range Adjust	*C
M ▲ / E ▼	Enter	*100 PPM	Select [E] to select or ▲ or ▼ to select another and press [E]	
M ▲ / E ▼	Down	10 PPM	Press [E] if selecting 0-10 PPM range	
M ▲ / E ▼	Down	USER	Press [E] if selecting User adjustable range	
M ▲ / E ▼	Enter	100 PPM	Select [E] to select or ▲ or ▼ to select another and press [E]	
4-20 mA Adjustment Example				
M ▲ / E ▼	Enter	Calib	S.P. Function - Calib Adjust	*D
M ▲ / E ▼	Enter	Out: 4mA	Use ▲ or ▼ keys to select 4 mA or 20mA	
M ▲ / E ▼	Enter	4mA	Selects 4 mA	
M ▲ / E ▼	Enter	ACK	Momentary Acknowledge of new Set Point	
M ▲ / E ▼	Mode	Calib	S.P. Function - Calib Adjust	
M ▲ / E ▼	Down	CalibOut	S.P. Function - Output during Calibration Adjust	
M ▲ / E ▼	Enter	Track	Use ▲ or ▼ keys to select Track, C2.50mA, C4.00mA	
			Track = Output during calibration tracks the calibration gas, C2.50mA = Output during calibration is 2.50 mA, C4.00mA = Output during calibration is 4.0 mA	
M ▲ / E ▼	Enter	*Track	* = Current selection	
RS-485 Adjustment Example				
M ▲ / E ▼	Enter	Address	S.P. Function - RS-485 Address Adjust	*E
M ▲ / E ▼	Enter	Addr:016	Use ▲ or ▼ keys to enter new address	
M ▲ / E ▼	Enter	ACK	New address selected	
M ▲ / E ▼	Enter	Address	S.P. Function - RS-485 Address Adjust	
M ▲ / E ▼	Down	Baud	S.P. Function - RS-485 Baud Rate Adjust	
M ▲ / E ▼	Enter	*38400	Press [E] to select or [▲] or [▼] to select another	

Table 5-3: Set-Up Configuration (Continued)

5.5 MAINTENANCE SUB-MENU

The maintenance menu enables the operator to view sensor and software versions. Sierra Monitor technical support has access to other values as needed. The maintenance menu operation is described in Table 5-4.

Key	Function	Display	Description	Reference
		XXXPPM	Default Display	
M ▲ E ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M ▲ E ▼	Mode	CALIB:--	Mode Function - Calibrate	
M ▲ E ▼	Mode	SETUP:-	Mode Function - Set Point Adjustments	
M ▲ E ▼	Mode	MAINT:--	Mode Function - Maintenance	
M ▲ E ▼	Enter	3.XX	Module Software Version Number	
M ▲ E ▼	Enter	CCC001	Module Custom Configuration Control number	

Table 5 - 4: Maintenance Menu

6. CALIBRATION

6.1 CALIBRATION FREQUENCY

The Gas Sensor Module has been calibrated in the factory prior to shipment. It is recommended that the user calibrate before placing into service. The sensor module must be calibrated every 180 days at a minimum. Periodic functional tests are advisable for critical applications and hostile environments. Oxygen sensors will require more frequent adjustment.

The sensor module microprocessor software includes high-level self-checking algorithms which provide continuous sensor diagnostic and self-adjustment. Users may select to increase calibration frequencies based on low-drift experience during first two calibration periods.

6.2 CALIBRATION PREPARATION

Calibration of the sensor is accomplished by simple menu based steps and application of span gas.

NOTE
If an error is made during any stage of the calibration process, hold the magnet stick at the [M] for 10 seconds. A scrolling display will indicate "calibration aborted" and the sensor module will exit the calibration activity and return to normal operating mode. The calibration procedure can then be restarted.

Calibration must be performed only when the area is known to be clear of the gas of interest. When in doubt, use a portable instrument to confirm that there is no background.

For compliance with Factory Mutual (FM) Approvals, the Sierra Monitor Model 1250-01, 1260 -05 and 1260-45 are the FM Approved calibration gas delivery devices. Use the Model 5358-01 Calibration Adapter delivery fitting.

NOTE: Refer to Appendix G1 for information on use of permeation tube for 5100-25-IT and Appendix G2 for 5100-26-IT calibration.

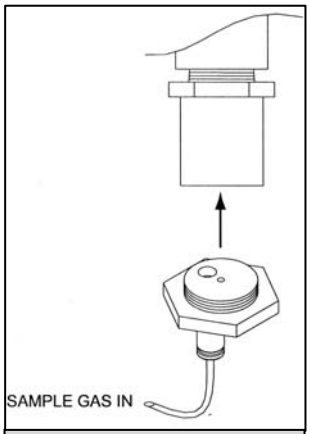


Figure 6 - 1: Model 5358-01 Calibration Adapter

6.3 CALIBRATION GAS DELIVERY METHODS

Calibration gas can be delivered to the sensors via the Model 5358-01:

Calibration Adapter (Figure 6-1) - used with portable calibrators.

CALIBRATION PROCEDURE

The Calibration Menu is described on Table 6-1:

The procedure requires that the menu "keys" be activated using the magnet stick.

Each key press steps through the process of setting the zero value for clean air and then setting the span value.

At each of these steps, apply calibration gas of the value corresponding to the setting accepted on the sensor module display.

6.4 SENSOR EXPOSURE TO GAS

Calibration gas must be delivered to the sensor using the flow rate and duration listed in below:

Model	Calibration Gas	Flow	Period
5100-03-IT	Air	300 cc of Zero Air or exposure to Ambient Air (3 minutes)	
5100-04-IT	Carbon Monoxide	300 cc/min	Until Stable (minimum 3 minutes)
5100-05-IT	Hydrogen Sulfide	300 cc/min	Until Stable (minimum 3 minutes)
5100-06-IT	Chlorine	300 cc/min	Until Stable (minimum 3 minutes)
5100-08-IT*	Chlorine Dioxide	300 cc/min	Until Stable (minimum 3 minutes)
5100-10-IT	Sulfur Dioxide	300 cc/min	Until Stable (minimum 3 minutes)
5100-12-IT	Nitrogen Dioxide	300 cc/min	Until Stable (minimum 3 minutes)
5100-15-IT	Hydrogen Sulfide	300 cc/min	Until Stable (minimum 5 minutes)
5100-21-IT	Hydrogen Chloride	300 cc/min	
5100-25-IT	Ammonia	See Appendix G1	
5100-26-IT	Hydrogen Fluoride	See Appendix G2	
5100-88-IT	Carbon Dioxide	300 cc/min	Until Stable (minimum 3 minutes)

* Note: Use 5PPM Cl_2 to calibrate (set module to 1.5 PPM ClO_2)

6.5 CALIBRATION SUB-MENU

Key	Function	Display	Description	Reference
		XXXPPM	Default Display	
M E ▲ ▼	Mode	ALMRSET:	Mode Function - Alarm Reset	
M E ▲ ▼	Mode	CALIB:--	Mode Function - Calibrate	
M E ▲ ▼	Enter	CAL-0PPM-	Banner: Apply zero gas, enter <E> when done (Not Applicable for 5100-03-IT)	*
			Operation: Confirm area clear of gas, or apply zero air to sensor.	
M E ▲ ▼	Enter	ACK	Zero gas setting acknowledged	
		10PPM-SP	Banner: Select span, enter <E> to calibrate sensor Banner: (5100-03-IT) Specify Cal gas <E> when done	Sub A
M E ▲ ▼	Enter	C 4 PPM	Banner: Apply span gas, then enter <E> to calibrate gas sensor	Sub B
		C 4 PPM	*Operation: Apply calbration gas.*	
		CXXXPPM	*Operation: As gas is applied the reading will increase - wait 3 minutes*	
M E ▲ ▼	Enter	CAL-OK	Calibration Passed - now remove gas	
		WAIT-300	*Operation: Five minute time out before sensor is returned to service.*	
Sub-Routines				
		10PPM-SP	Banner: Select span, enter <E> when done	Sub A
M E ▲ ▼	Down	25PPM-SP	*Operation: Change Span Gas Value to 25PPM*	
M E ▲ ▼	Down	Adj-SPAN	*Operation: User adjustable value*	
M E ▲ ▼	Enter	25PPM-SP	*Operation: Ready for user adjustment*	
M E ▲ ▼	Enter	C 25PPM	Banner: Apply 25PPM gas, then enter <E> to calibrate gas sensor	Sub B
		C 25PPM	*Operation: Apply calbration gas.*	
M E ▲ ▼	Enter	CAL-FAIL	*Operation: No calibration gas applied, or sensor did not respond correctly.*	
		WAIT-300	*Operation: Five minute time out before sensor is returned to service.*	
M E ▲ ▼	Mode	(Any)	*Operation: Hold magnet over Mode Switch for ten senconds to abort calibration*	Sub C
			Banner: Calibration Aborted	
		XXXPPM	Default Display	

Table 6 - 1: Calibration

- 5100-03-IT Oxygen Deficiency

  It is recommended to use fresh Air as the calibration source for the Oxygen detector. If the area is known to be safe with adequate air flow, you may use the surrounding Air to set the instrument span at 20.9 %. If the condition of the environment is unknown, then the customer may use a cylinder of Zero Air as the span gas. Please note that the Oxygen concentration contained in Zero Air cylinders may have anywhere from 20.0 to 21.0 % Oxygen as it is not a precise standard.

  To calibrate the Oxygen sensor module, place the module into the calibration mode using the magnetic wand. Press the Mode key until CALIB is displayed. Press Enter to begin. Select Calibration value to be 20.9%. Press Enter to confirm. Apply span gas or use the surrounding Air then press Enter to complete procedure.

- 5100-88-IT Carbon Dioxide

  The CO_2 transmitter also has a span only calibration adjustment. There is no zero adjustment or requirement to apply Zero gas. To calibrate the CO_2 detector, place the module into the calibration mode using the magnetic wand. Press the Mode key until CALIB is displayed. Press Enter to begin. Select calibration value, typical 2500 ppm, and press Enter to confirm. Apply span gas for at least 3 minutes or until stable. Press Enter to complete procedure.

NOTE
The Analog output values to be transmitted during the calibration procedure are selected in the maintenance configuration. Normal 20.9% value provides 17.3 mA.

7. SERVICE

7.1 SENSOR MODULE CONFIGURATION

The gas sensor module is comprised of the following sub-assemblies (Figure 7-1):

5100-XX-IT	Gas Sensor Module (See Appendix B)
SPL21810	Aluminum Enclosure
SPL21823	316SS Enclosure
XXXXXXX	Transmitter Assembly (See Appendix B)
XXXXXXX	Sensor Assembly (See Appendix B)
5200-XX-IT	Sensor (See Appendix B)

7.2 ENCLOSURE REPLACEMENT

The enclosure should be replaced if the cover threads or conduit threads have been damaged, or if the enclosure has been damaged sufficiently that it no longer meets the required NEMA classification.

To replace the enclosure follow the transmitter and sensor assembly removal instructions, remove the damaged enclosure from its conduit, install a new enclosure and continue the transmitter and sensor assembly replacement instructions.

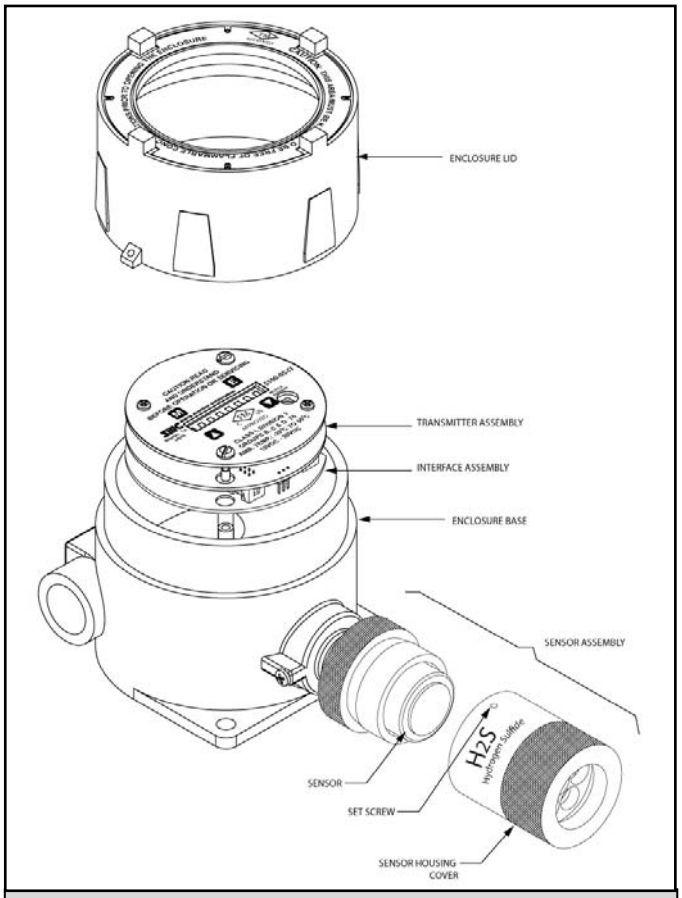


Figure 7 - 1: Module Components

7.3 TRANSMITTER REPLACEMENT

The transmitter assembly should be replaced when it is determined that it is unreliable, noisy or cannot be adjusted for calibration. This may occur due to age, corrosion or failed components.

To replace the transmitter assembly:

a. Remove the cover of the main enclosure.
b. Unscrew the two thumb screws in the top of the cover plate, lift the assembly and rotate 90^{o} to relieve the wiring service loop.
c. Remove all wires from bond, marking them carefully so they can be correctly replaced.
d. Unplug the sensor connector from the transmitter.
e. Reverse the preceding steps to install the new transmitter.
f. Restore power and allow a minimum of 30 minutes for stabilization before re-calibration.

7.4 SENSOR REPLACEMENT

NOTE: Refer to Appendix H for information on sensor electrolyte replacement for 5100-25-IT and 5100-26-IT.

The gas sensor which is located inside the sensor assembly housing can be replaced without replacement of the housing. The gas sensor needs replacement when:

- The "CAL-FAIL" message appears after calibration.
- The sensor output signal is noisy, causing erroneous gas level readings.
- The "Sensor Failure" message displays.

To replace the sensor:

a. Confirm that system power has been removed.
b. Remove the gas sensor module enclosure cover.
c. Unscrew the two thumb screws in the top of the faceplate, lift the transmitter assembly and rotate 90^{o} to relieve the wiring service loop.
d. Unplug the sensor connector from the transmitter.
e. Unscrew the old sensor assembly from the enclosure conduit hub. Remove the sensor assembly with its harness.
f. Unscrew sensor housing cover from the sensor.
g. Carefully pull the old sensor straight up from the socket.
h. Press the new sensor into the socket.
i. Reverse the preceding steps to install the sensor assembly.
j. Allow the new sensor to stabilize for a minimum of 60 minutes and then calibrate using the procedure in Section 6.

7.5 INSTALLATION INSPECTION

Prior to system start-up or trouble shooting, the entire system should be visually inspected. The following are guidelines for that inspection:

7.5.1 CONTROLLER INSTALLATION

- Controller installed in conformance to instruction manual recommendations.
- AC power is correctly grounded.
- Hot AC and relay connections have safety covers installed.

7.5.2 CABLING INSTALLATION

- All splices are soldered or via terminal block.
- Cabling is away from sources of electrical noise or RFI where possible.

7.5.3 SENSOR MODULE INSTALLATION

- Module installation in conformance with this manual.
- Modules accessible for calibration.
- Wiring terminations clean and correct.

7.5.4 MOISTURE TRAPS AND RAINSHIELDS

- Conduit seals and drains installed to avoid moisture build up in electronics enclosure. Water accumulation in sensor module enclosures is a major cause of damage and system failures - take precautions to seal electrical conduits and provide moisture traps and drains to avoid water damage.
- Rain-shields installed where applicable.

7.5.5 STANDARD VOLTAGES

- Regulated DC voltage to be applied to the sensor module must be between 10 VDC and 30 VDC.

7.6 INSPECTION AND TROUBLESHOOTING GUIDE

The inspection and troubleshooting guide can be used to step through the system start-up and to determine the corrective action if a fault occurs.

7.6.1 IF IR MODULE DOES NOT RESPOND TO GAS

1. Repeat calibration procedure.
2. Remove the gas and wait for the timer to completely count down.
3. Apply calibration gas and verify that the sensor sees calibration gas after calibration.
4. If the sensor still does not see gas, power cycle the unit and repeat calibration.

7.6.2 IF THE MODULE DISPLAYS “STARTING” FOR MORE THAN 1 HOUR

1. Make sure the sensor is placed in an ambient room temperature environment.
2. Power cycle the sensor.
3. Ensure that the sensor is not exposed to gas of interest during warm-up.

7.6.3 IF THE MODULE DOES NOT DISPLAY THE CORRECT %PPM

1. Power cycle the unit.
2. Recalibrate the sensor.

7.6.4 IF THE DISPLAY SHOWS ‘F’ – SENSOR MISSING OR BAD SENSOR

1. Power down the unit.
2. Open the enclosure and unplug the sensor assembly from the transmitter board.
3. Plug the sensor back into the transmitter board carefully and ensure a secure fit.
4. Check all other connections.
5. Power up the unit.

7.6.5 IF THE MODULE SHOWS “***CALIBRATION REQUIRED***”

1. Calibrate the module.

7.6.6 IF THE DISPLAY SHOWS ‘H’ (OR L) THEN THE LOCAL HIGH OR LOW ALARM IS ACTIVE

7.6.7 IF THE DISPLAY SHOWS “M” – NOT CALIBRATED

1. Calibrate the module.

7.6.8 IF THE DISPLAY SHOWS “C” – CALIBRATION MODE

1. Complete calibration and exit to operating mode.

7.6.9 IF THE DISPLAY SHOWS “S” – SENTRY CONNECTION

1. Check connections with Sentry Controller

7.6.10 DIAGNOSTIC LEDS

LED 1 = 1 Hz Heartbeat normal, 2 Hz Panic Error
2 = Computation process
3 = 1 Hz Heartbeat normal
4 = HART or Sentry comms activity

8. APPENDICES

8.1 APPENDIX A: SPECIFICATIONS

Sensor:

Type: Electrochemical

	Standard Range [1]	Optional Max Range	Zero Drift	Repeatability	Linearity	Resolution	Response Time [2]	Accuracy	Sensor Life [3]
5100-03-IT O_2	5-25% Vol	0-25% Vol	+/- 0.1%	+/- 0.2%	+/- 0.2%	+/- 0.1%	<10 sec.	+/- 0.2%	2 years
5100-04-IT CO	0-500 PPM	1200 PPM	+/- 1 PPM	+/- 1 PPM	+/- 1 PPM	0.5 PPM	<35 sec.	+/- 1 PPM	2 years
5100-05-IT H_2S [5]	0-100 PPM	100 PPM	+/- 0.5 PPM	+/- 1 PPM	+/- 1 PPM	0.1 PPM	<35 sec.	+/- 3 PPM [6]	2 years
5100-06-IT Cl_2	0-10.0 PPM	10.0 PPM	+/- 0.5 PPM	+/- 0.5 PPM	+/- 0.5 PPM	0.1 PPM	<60 sec.	+/- 0.5 PPM	2 years
5100-08-IT ClO_2	0-3.0 PPM	3.0 PPM	+/- 0.5 PPM	+/- 0.5 PPM	+/- 0.5 PPM	0.1 PPM	<60 sec.	+/- 0.5 PPM	2 years
5100-10-IT SO_2	0-100 PPM	100 PPM	+/- 0.5 PPM	+/- 1 PPM	+/- 1 PPM	0.5 PPM	<20 sec.	+/- 0.5 PPM	2 years
5100-12-IT NO_2	0-20 PPM	20.0 PPM	+/- 0.5 PPM	+/- 0.5 PPM	+/- 0.5 PPM	0.2 PPM	<35 sec.	+/- 0.5 PPM	2 years
5100-15-IT H_2S [9]	0-100 PPM	100 PPM	+/- 0.5 PPM	+/- 1 PPM	+/- 1 PPM	0.1 PPM	<20 sec.	+/- 5%	2 years
5100-21-IT HCl	0-20 PPM	20.0 PPM	+/- 0.5 PPM	+/- 0.5 PPM	+/- 0.5 PPM	0.2 PPM	<35 sec.	+/- 0.5 PPM	2 years
5100-25-IT NH_3 [4]	0-100 PPM	100 PPM	+/- 1.0 PPM	+/- 1.0 PPM	+/- 1.0 PPM	+/- 1 PPM	<30 sec.	+/- 1 PPM	1 year [7]
5100-26-IT HF [4]	0-10 PPM	10 PPM	--	--	--	0.5 PPM	<30 sec.	+/- 1 PPM	1 year [7]
5100-88-IT CO_2 [8]	0-5000 PPM	5000 PPM	+/- 1.0 PPM	+/- 1.0 PPM	+/- 1.0 PPM	+/- 1 PPM	<20 sec.	+/- 2%	2 years

(1) Optional ranges available
(2) Response time to 90% full signal value for applied concentration
(3) Sensor life typical for use at standard temperature and pressure with occasional exposure to gas of interest
(4) Diffusion via membrane. Requires electrolyte
(5) Max range, zero drift, linearity, resolution, and sensor life, have not been verified by FM Approvals.
(6) Or +/- 10% of reading, whichever is greater
(7) Electrolyte recharge only
(8) Infrared
(9) Solid State MOS

Output:

Display: Fixed and Scrolling LED
Relays Option: 5 Amp, High Alarm, Low Alarm, .25 Amp Trouble all SPDT
Analog Output: Analog 4-20 mA (Trouble 1.5mA, Calibration 2.5mA)
Loop Resistance 800 ohm
Signal Output: Sentry digital bus
Analog 4-20 mA
3-wire Non-Isolated
4-wire Isolated
Serial RS-485 Modbus RTU
HART

Input:

Remote Alarm Reset: Normally open digital input

Power:

Power consumption: 2 watts (4 watts for 5100-15-IT and 5100-88-IT)
Input voltage: 24 VDC nominal: 10-30VDC

Operating Range:

	Ambient Temp (°F)	Ambient Temp (°C)	Relative Humidity
5100-03-IT O_2	5 to 122 °F	-15 to 50 °C	15 – 90%
5100-04-IT CO	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-05-IT H_2S (1)	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-06-IT Cl_2	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-08-IT ClO_2	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-10-IT SO_2	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-12-IT NO_2	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-15-IT H_2S	- 40 to 167 °F	-40 to 75 °C	0 – 99%
5100-21-IT HCl	- 4 to 122 °F	-20 to 50 °C	15 – 90%
5100-25-IT NH_3	+14 to 113 °F	-10 to 45 °C	20 – 95%
5100-26-IT HF	+14 to 113 °F	-10 to 45 °C	20 – 95%
5100-88-IT CO_2	- 4 to 140 °F	-20 to 60 °C	15 – 90%

(1) Performance tested by FM Approvals to -40°C/°F

Enclosure:

Material - Aluminum:		Polyester powder-coated, sand-cast, copper-free aluminum
Material - Stainless Steel:		316 Stainless Steel
Dimensions: (HxWxD) (differs for 5100-25-IT & 5100-26-IT)		
	(A1 & A2)	7.9 x 5.7 x 3.9 in. (20.1 x 14.5 x 9.9 cm)
	(S1 & S2)	7.6 x 4.4 x 4.9 in. (19.3 x 11.2 x 12.4 cm)
Weight:	(A1 & A2)	3.4 lb. (1.5 Kg)
	(S1 & S2)	7.2 lb. (3.3 Kg)
Housing:		NEMA 4X, NEMA 7
Hazardous Area Approval:		Explosion proof, Class 1, Div. I, Groups B, C, D Group IIB + H2 IP66, IP65, NEMA 4X

Electrical Approvals:

Factory Mutual (FM):	Class 1, Div. I, Groups B, C, D FM Standards 3600, 3615, 3810
UL:	UL Standard 508A
ATEX (5100-XX-IT):	II 2 G Ex d IIB+H2 T6 Gb Ta = -20°C to +50°C

Performance Approvals:

FM Performance Approval:	FM Performance Approval (5100-05-IT) (Appendix I) SIL-2 Certified (5100-04-IT, 5100-05-IT, 5100-06-IT, 5100-15-IT) CE Mark (5100-05-IT) ABS (5100-05-IT) CQST

Remote Sensor Option (Appendix D):

Distance between sensor and transmitter:

5100-03-IT	10 feet	5100-06-IT	10 feet
5100-04-IT	15 feet	5100-08-IT	10 feet
5100-05-IT	15 feet	5100-10-IT	15 feet

Warranty:

Limited Warranty: 2 years

Specifications subject to change without notice

Cross Sensitivity Data:

5100-04-IT Carbon Monoxide

Gas	Conc.	Response
HS	15 PPM	~38 PPM
SO_2	5 PPM	~3 PPM
NO	35 PPM	~10 PPM
NO_2	5 PPM	~-3 PPM
H_2	100 PPM	<60 PPM
C_2H_4	100 PPM	<100 PPM
HCN	10 PPM	~5 PPM
HCl	5 PPM	0 PPM

5100-05-IT Hydrogen Sulfide

Gas	Conc.	Response
CO	400 PPM	<.1 PPM
SO_2	20 PPM	<10 PPM
NO	50 PPM	<3 PPM
NO_2	10 PPM	<-30 PPM
Cl_2	10 PPM	<-25 PPM
H_2	400 PPM	1 PPM
C_2H_4	400 PPM	<0.1 PPM
NH_3	20 PPM	<0.1 PPM

5100-06-IT Chlorine &
5100-08-IT Chlorine Dioxide

Gas	Conc.	Response
CO	300 PPM	0 PPM
H_2S	15 PPM	0 to -3.38 PPM
SO_2	5 PPM	-0.05 PPM
NO	35 PPM	0 PPM
NO_2	5 PPM	~5 PPM
H_2	100 PPM	0 PPM
C_2H_4	100 PPM	0 PPM
HCN	10 PPM	0 PPM
HCl	5 PPM	0 PPM
ClO_2	3 PPM	10 PPM

5100-10-IT Sulfur Dioxide

Gas	Conc.	Response
H_2S	15 PPM	0 PPM
NO	35 PPM	-7 to 0 PPM
NO_2	5 PPM	-5 PPM
Cl_2	5 PPM	-1.5 to 0 PPM
NO_2	5 PPM	~5 PPM
H_2	100 PPM	0 PPM
HCN	10 PPM	<5 PPM
HCl	5 PPM	0 PPM
C_2H_4	100 PPM	0 PPM

5100-12-IT Nitrogen Dioxide

Gas	Conc.	Response
CO	300 PPM	0 PPM
H_2S	15 PPM	-1.5 to 0 PPM
SO_2	5 PPM	-0.05 to 0 PPM
NO	35 PPM	0 PPM
Cl_2	1 PPM	~1 PPM
H_2	100 PPM	0 PPM
HCN	10 PPM	0 PPM
HCl	5 PPM	0 PPM
C_2H_4	100 PPM	0 PPM

5100-21-IT Hydrogen Chloride

Gas	Conc.	Response
CO	300 PPM	<3 PPM
H_2S	15 PPM	27 to 45 PPM
SO_2	5 PPM	1.5 to 3.5 PPM
NO	35 PPM	0 PPM
NO_2	5 PPM	0.5 to 1 PPM
Cl_2	1 PPM	-0.05 to 0.1 PPM
H_2	100 PPM	<0.5 PPM
HCN	10 PPM	<0.3 PPM

5100-25-IT Ammonia

Gas	Conc.	Response
CO	1000 PPM	0 PPM
SO_2	15 PPM	>40 PPM
NO	100 PPM	0 PPM
NO_2	60 PPM	0 PPM
H_2	4%	0 PPM
CH_4	4%	0 PPM
HCN	10 PPM	75 PPM
H_2S	3 PPM	75 PPM

5100-26-IT Hydrogen Fluoride

Gas	Conc.	Response
Cl_2	5 PPM	8 PPM
HCl	5 PPM	9 PPM
NH_3	75 PPM	0 PPM
SiH_4	15 PPM	0 PPM
CO	1000 PPM	0 PPM
SO_2	5 PPM	9 PPM
NO	100 PPM	0 PPM
NO_2	15 PPM	2 PPM
H_2	4%	0 PPM
H_2S	30 PPM	0 PPM

8.2 APPENDIX B: MODEL NUMBERS & PARTS LIST

	Sensor Module							
Model	**Gas**		**Enclosure**	**Relay/Connection Output**		**Sensor Protection**	**Remote Option**	**ATEX**
5100	**- XX**	**- IT**	**- XX**	**- XX**	**- XX**	**- X**	**- X**	**- X**
5100 Series	- 03 = O_2	- IT Series	- A1 = AL ¾" NPT	- 01 = No Relays (std)	- 00 = Std	- 0 = Standard	- 0 = None	- 0 = Standard
	- 04 = CO		- A2 = AL M20 x 1.5	- 02 = Relays Option		- 1 = Conformal Sensor	- 1 = Remote Sensor	- C = ATEX/IECEx (5100-05 only)
	- 05 = H_2S		- S1 = SS ¾" NPT	- 05 = HART Option				
	- 06 = Cl_2		- S2 = SS M20 x 1.5					
	- 08 = ClO_2							
	- 10 = SO_2							
	- 12 = NO_2							
	- 15 = H_2S							
	- 21 = HCl							
	- 25 = NH_3							
	- 26 = HF							
	- 88 = CO_2							

Options	5311-00	Rainshield
	5311-02	Rainshield with calibration port
Calibration Items	1250-01	Gas Sensor Calibration Kit, Type A (CO, H_2S, Air)
	1250-02	Gas Sensor Calibration Kit, Type B (SO_2, NO_2)
	1250-03	Gas Sensor Calibration Kit, Type C (Cl_2)
	1260-00	Gas Cylinder, Air, (Type A), 105 liters
	1260-04	Gas Cylinder, CO 100 PPM, (Type A) 57 liters
	1260-05	Gas Cylinder, H_2S in N_2, 25 PPM, (Type A) 57 liters
	1260-06	Gas Cylinder, Cl_2, 5 PPM, (Type C) 104 liters
	1260-10	Gas Cylinder, SO_2, 50 PPM, (Type B) 74 liters
	1260-12	Gas Cylinder, NO_2, 10 PPM, (Type B) 74 liters
	1260-13	Gas Cylinder, CO, 1000 PPM, (Type A), 105 liters
	5360-00	Calibrator Head Standard
	1256-01	Regulator Type A Calibrator
	1256-02	Regulator Type B Calibrator
	1265-03	Regulator Type C Calibrator
	5358-01	Calibration Adapter - Direct, Standard
	5358-51	Calibration/Configuration Magnetic Tool, 4501-XX
	9210-00	Calibrator, Permeation Tube
	9211-09	Permeation Tube, Ammonia, NH_3
	SPX27057	Kit, Sensor Recharge, for 5100-25-IT
	SPX27061	Kit, Sensor Recharge, for 5100-26-IT
	See Appendix D for 5100-25-IT and 5100-26-IT	
Spare Parts	5200-03-IT	Sensor, for 5100-03-IT
	5200-04-IT	Sensor, for 5100-04-IT
	5200-05-IT	Sensor, for 5100-05-IT
	5200-06-IT	Sensor, for 5100-06-IT / 5100-08-IT
	5200-10-IT	Sensor, for 5100-10-IT
	5200-12-IT	Sensor, for 5100-12-IT
	5200-21-IT	Sensor, for 5100-21-IT
	SPL21834	Sensor Assembly, Aluminum, for 5100-03-IT - Oxygen
	SPL21832	Sensor Assembly, Aluminum, for 5100-04-IT - CO
	SPL21830	Sensor Assembly, Aluminum, for 5100-05-IT - H_2S
	SPL21833	Sensor Assembly, Aluminum, for 5100-06-IT / 5100-08-IT - Cl_2 & ClO_2
	SPL21844	Sensor Assembly, Aluminum, for 5100-10-IT - SO_2
	SPL21845	Sensor Assembly, Aluminum, for 5100-12-IT – NO_2
	SPM21878	Sensor Assembly, Plastic, for 5100-26-IT
	SPM27082	Sensor Assembly, 316SS, for 5100-03-IT - Oxygen
	SPM27083	Sensor Assembly, 316SS, for 5100-04-IT - CO
	SPM27074	Sensor Assembly, 316SS, for 5100-05-IT - H_2S
	SPM27084	Sensor Assembly, 316SS, for 5100-06-IT / 5100-08-IT - Cl_2 & ClO_2
	SPM27087	Sensor Assembly, 316SS, for 5100-10-IT - SO_2
	SPM27088	Sensor Assembly, 316SS, for 5100-12-IT - NO_2
	SPL21824	Transmitter
	SPL21810	Enclosure, Transmitter, Aluminum
	SPL21823	Enclosure Transmitter, 316SS
	SPL21825	Interface Board without Relay
	SPL21829	Interface Board with Relay

8.3 APPENDIX C: LIMITED WARRANTY

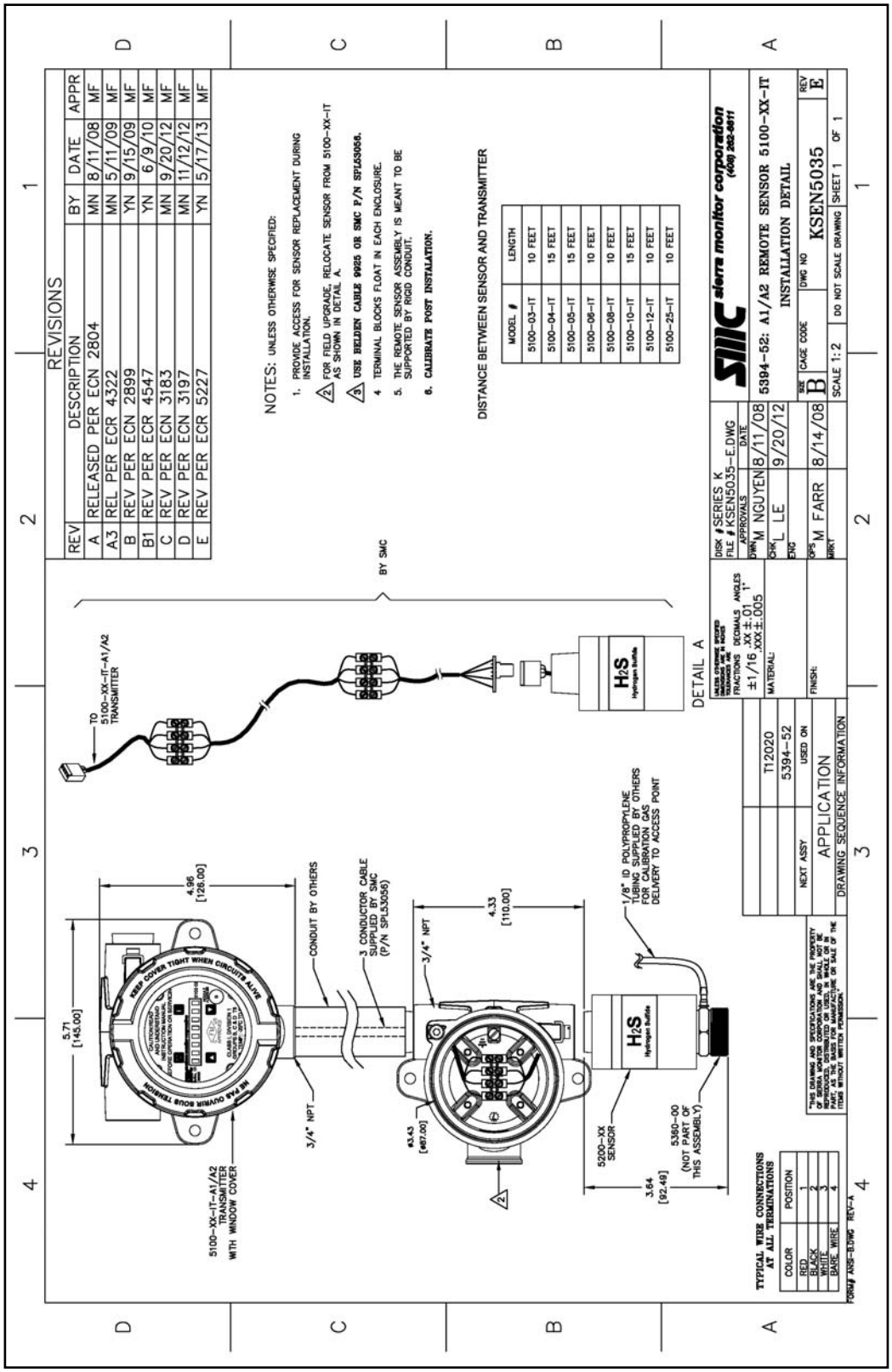
SIERRA MONITOR CORPORATION warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. SMC will repair or replace without charge any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by SMC personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without SMC approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables (i.e. calibration gases, batteries, sensors), nor to any damage resulting from battery leakage.

In all cases SMC's responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, SMC disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of SMC for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.

8.4 APPENDIX D: REMOTE SENSOR DRAWING

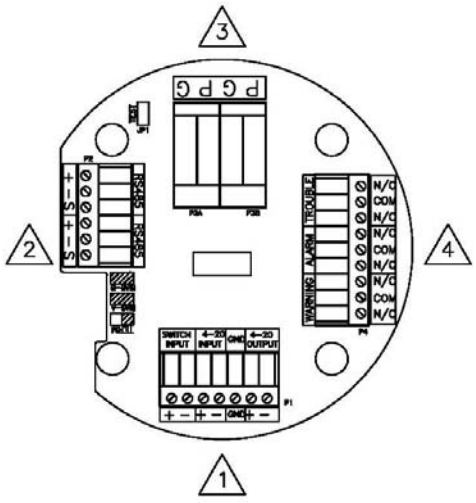

REVISIONS
REV | DESCRIPTION | BY | DATE | APPR
A | RELEASED PER ECN 2804 | MN | 8/11/08 | MF
A3 | REL PER ECR 4322 | MN | 5/11/09 | MF
B | REV PER ECN 2899 | YN | 9/15/09 | MF
B1 | REV PER ECR 4547 | YN | 6/9/10 | MF
C | REV PER ECN 3183 | MN | 9/20/12 | MF
D | REV PER ECN 3197 | MN | 11/12/12 | MF
E | REV PER ECR 5227 | YN | 5/17/13 | MF
NOTES: UNLESS OTHERWISE SPECIFIED:
1. PROVIDE ACCESS FOR SENSOR REPLACEMENT DURING INSTALLATION.
2 FOR FIELD UPGRADE, RELOCATE SENSOR FROM 5100-XX-IT AS SHOWN IN DETAIL A.
3 USE BELDEN CABLE 9825 OR SMC P/N SPL53056.
4. TERMINAL BLOCKS FLOAT IN EACH ENCLOSURE.
5. THE REMOTE SENSOR ASSEMBLY IS MEANT TO BE SUPPORTED BY RIGID CONDUIT.
6. CALIBRATE POST INSTALLATION.
DISTANCE BETWEEN SENSOR AND TRANSMITTER
MODEL # | LENGTH
5100-03-IT | 10 FEET
5100-04-IT | 15 FEET
5100-05-IT | 15 FEET
5100-08-IT | 10 FEET
5100-08-IT | 10 FEET
5100-10-IT | 15 FEET
5100-12-IT | 10 FEET
5100-25-IT | 10 FEET
BY SMC
DETAIL A
TO 5100-XX-IT-A1/A2 TRANSMITTER
H2S Hydrogen Sulfide
4.96 [126.00]
5.71 [145.00]
CONDUIT BY OTHERS
3 CONDUCTOR CABLE SUPPLIED BY SMC (P/N SPL53056)
3/4" NPT
4.33 [110.00]
1/8" ID POLYPROPYLENE TUBING SUPPLIED BY OTHERS FOR CALIBRATION GAS DELIVERY TO ACCESS POINT
KEEP COVER TIGHT WHEN CIRCUITS ALIVE
NE PAS OUVRIR SOUS TENSION
5100-XX-IT-A1/A2 TRANSMITTER WITH WINDOW COVER
3/4" NPT
ø3.43 [87.00]
5200-XX SENSOR
3.64 [92.49]
5360-00 (NOT PART OF THIS ASSEMBLY)
TYPICAL WIRE CONNECTIONS AT ALL TERMINATIONS
COLOR | POSITION
RED | 1
BLACK | 2
WHITE | 3
BARE WIRE | 4
DISK # SERIES K
FILE # KSEN5035-E.DWG
APPROVALS | DATE
DWN M NGUYEN | 8/11/08
CHK L LE | 9/20/12
ENG
QPS M FARR | 8/14/08
MFRT
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ±1/16 DECIMALS .XX ±.01 .XXX ±.005 ANGLES 1°
MATERIAL: T12020
5394-52
NEXT ASSY | USED ON
FINISH:
APPLICATION
DRAWING SEQUENCE INFORMATION
sierra monitor corporation (408) 262-6611
5394-52: A1/A2 REMOTE SENSOR 5100-XX-IT INSTALLATION DETAIL
SIZE B | CAGE CODE | DWG NO KSEN5035 | REV E
SCALE 1:2 | DO NOT SCALE DRAWING | SHEET 1 OF 1
"THIS DRAWING AND SPECIFICATIONS ARE THE PROPERTY OF SIERRA MONITOR CORPORATION AND SHALL NOT BE REPRODUCED OR COPIED OR USED IN WHOLE OR IN PART, AS THE BASIS FOR MANUFACTURE OR SALE OF THE ITEMS WITHOUT WRITTEN PERMISSION."
705U4 ANS-ELDWG REV-A

NOTE
Drawing using Aluminum enclosure available from Sierra Monitor.

8.5 APPENDIX E: MODBUS MEMORY MAP

Register	Description	Read/ Write	Comments
40001	Concentration	R	Gas concentration multiplied by Gas Scale (e.g. 209 = 20.9%)
40002	Temperature	R	Temperature in degrees Celcius scaled by a factor of 10
40003	Alarm Relay	R/W	Boolean indicating the Alarm relay status (0 = No Alarm, 1 - (High) Alarm). Clearing bit will reset alarm.
40004	Warning Relay	R/W	Boolean indicating the Warning relay status (0 = No Alarm, 1 - Warning Alarm). Clearing bit will reset alarm.
40005	Warning Setpoint	R/W	Warning Alarm set point, used for activating Low Alarm multiplied by Gas Scale
40006	Alarm Setpoint	R/W	Alarm set point, used for activating High Alarm multiplied by Gas Scale
40007	CCC detail	R	e.g. 0001, 0007, etc
40008	Software Revision U	R	e.g. 201 denotes version 2.01
40009	Software Revision L	R	e.g. version aA is denoted by 0x6141
40010	Modbus Map Revision	R	e.g. version 2 is denoted as v2 = 0x7602
40011	Trouble Bits	R	0 = no trouble
40012	Trouble	R	1 for any trouble, 0 = no trouble
40013	Alarm Immediate	R	Like 40003, but never latched
40014	Warning Immediate	R	Like 40004, but never latched
40015	Serial Number U	R	Serial Number - 24 bits (presently set to Random ID)
40016	Serial Number L	R	
40017	Run time U	R	In seconds
40018	Run time L	R	In seconds
40019	Gas (MAX) value	R	Gas concentration multiplied by Gas Scale
40020	Model	R	Read as 51028 for IR, 51002 for Cat Bead, 51005 for TOXIC H2S etc.
40021	Range	RW	
40022	Units	RW	1 = %LEL, 2 = %VOL
40023	Module Status	R	A bit is defined for each of the following states: (no bit set also means some sort of trouble) Module State - In Calibration (0x40) = cal failed Module State - In Calibration (0x20) = cal passed Module State - In Calibration (0x10) Module State - Trouble (0x08) Module State - Warming (0x04) Module State - RUN (ALARM) (0x02) Module State - RUN (0x01)
40024	Gas Scale	R	Value like 1, 10 or 100
40025	Cal Concentration level	R/W	Gas concentration value used during calibration, multiplied by Gas Scale
40026	Calibration due, in days	R	Gets reset to 365 / 180 if cal successful, Less then 0 = calibration due
40027	Calibration Count	R	Counter increments if cal successful (0 = not calibrated)
40028	Display Gas Output	R	Gas value seen on display (i.e. useful during calibration)
40029	Gas (MIN) value	R	Minimum gas value multiplied by Gas Scale
40030	Alarm Time U	R	In seconds
40031	Alarm Time L	R	
40032	Warning Time U	R	In seconds
40033	Warning Time L	R	
40034	Trouble Time U	R	In seconds
40035	Trouble Time L	R	
40036	Max Gas Time U	R	In seconds
40037	Max Gas Time L	R	
40038	Min Gas Time U	R	In seconds
40039	Min Gas Time L	R	
40040	Rotary Switch	R	Module address (If value < 16, the value reflects position of rotary switch)
40041	Restart Count	R	Restart count
40042	Alarm Relay Action Setup	RW	Alarm Relay Action Setup - Latch/Sentry/Non-latch
40043	Warning Relay Action Setup	RW	Warning Relay Action Setup - Latch/Sentry/Non-latch
40044	4-20mA CalibOut Value	R	
40045	4-20mA TroubleOut Value	R	
40046	Gas Factor	RW	Applies only to -02
40047	Force Value	RW	
40048	Module Number	RW	
40049	Command Register	RW	0 indicates command failed, 1 = passed, supported commands: Lock keys = 101 Unlock keys = 102 Abort calibration = 103 Apply zero gas = 104 Apply span gas = 105 Ack alarms = 106 Reset sensor = 107 Clear mem = 108 Speed up startup = 109 Clear eeprom = 110 Force address disp= 111 Clear address disp= 112
40050	Last command executed	R	Displays last executed command from register 40049

8.6 APPENDIX F: HART



WIRING CONNECTIONS TABLE

1

P1	PCB Label		Function
1	Switch	IN +	Digital Input SW +
2		IN -	Digital Input SW -
3	4-20	IN +	4-20 mA Input +
4		IN -	4-20 mA Input -
5		GND	Ground
6	4-20	OUT +	4-20 mA Output +
7		OUT -	4-20 mA Output -

2

P2	PCB Label		Function
1	RS 485	+	RS 485 (+) (A)
2		-	RS 485 (-) (B)
3		S	RS 485 shield (Isolated GND)
4	RS 485	+	RS 485 (+) (A)
5		-	RS 485 (-) (B)
6		S	RS 485 shield (Isolated GND)

3

P3B	PCB Label		Function
1		P	Power
2		G	Ground
P3A			
3		P	Power
4		G	Ground

4

P4	PCB Label		Function
1	WARNING	N/C	Low Alarm Relay NC
2		COM	Low Alarm Relay COM
3		N/O	Low Alarm Relay NO
4	ALARM	N/C	High Alarm Relay NC
5		COM	High Alarm Relay COM
6		N/O	High Alarm Relay NO
7	TROUBLE	N/C	Trouble Alarm Relay NC *
8		COM	Trouble Alarm Relay COM *
9		N/O	Trouble Alarm Relay NO *

* Trouble relay is fail safe, so it is energized for normal operation, functions as labeled.

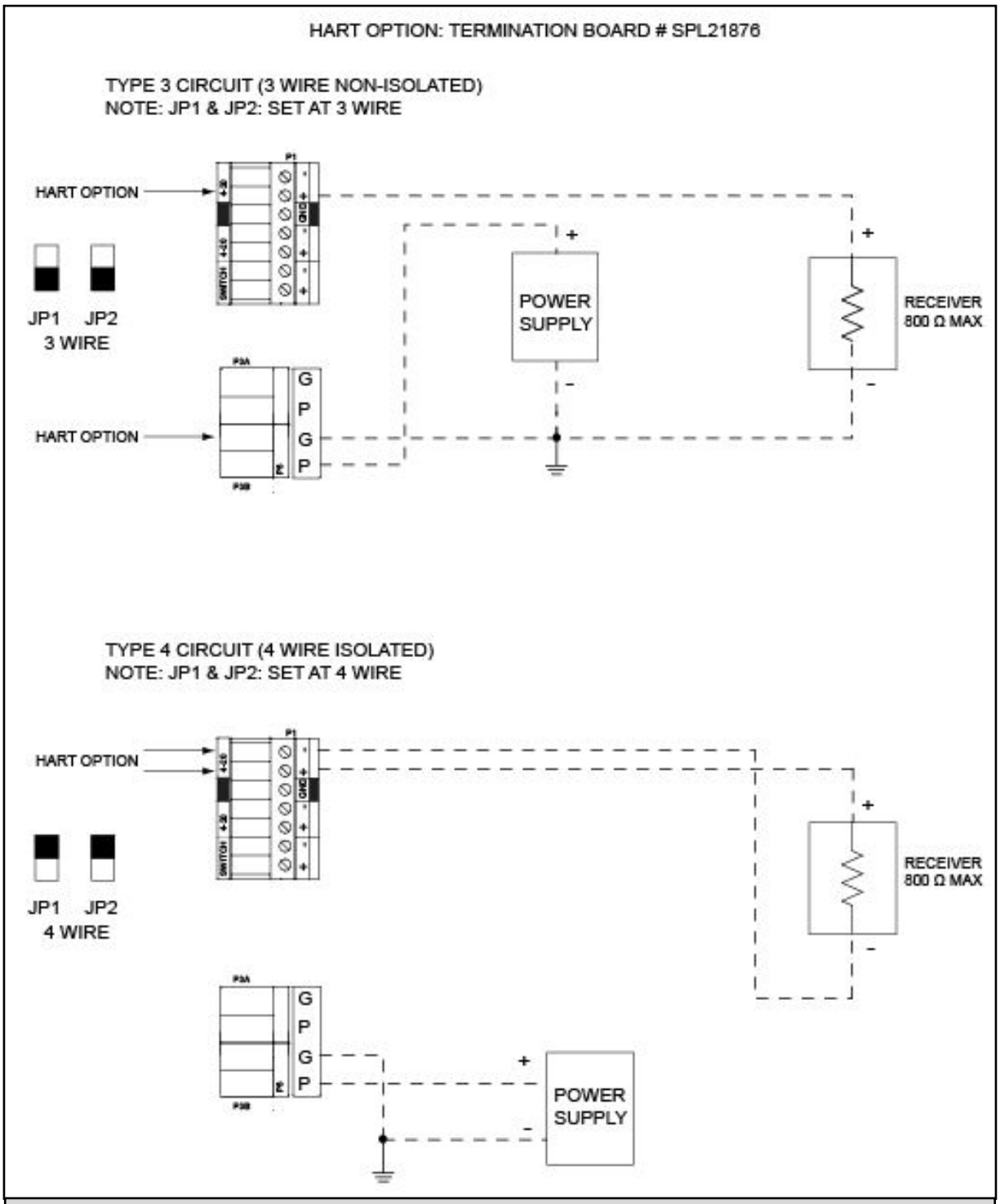


Figure 8 - 3: 4-20 mA Circuits Types 5100-XX-IT – Connections - HART

HART PROTOCOL MENU

HART (Highway Addressable Remote Transducer) Protocol is the global standard for sending and receiving digital information across analog wires between smart devices and control or monitoring system. HART is a bi-directional communication protocol that provides data access between intelligent field instruments and host systems. A host can be any software application from technician's hand-held device or laptop to a plant's process control, asset management, safety or other system using any control platform. The HART protocol used on this gas sensor module has been developed to comply fully with the HART specifications outlined by the HART Communication Foundation (HCF).

If the HART interface board has been provided with the gas sensor module, then HART will operate via the 4-20 mA interface automatically. While no specific handheld device is necessary for HART operation, the gas sensor module does comply with the HART standard so any handheld or PC-based HCF certified tool will work.

The information below provides the operator instructions on connecting HART and the HART Protocol Menu.

Common Practice Commands

The following Common Practice commands are implemented.

Command Number	Byte Number	Description
38	N/A	Reset Configuration Changed Flag
48	0	Returns Module Status Module State - In Calibration (0x10), (0x30 = cal passed) (0x50 = cal failed) Module State - Trouble (0x08) Module State – Warming (0x04) Module State - RUN (ALARM) (0x02) Module State – RUN (0x01)
48	1	Returns Alarm Relay Status 0x01 = Alarm Relay ON 0x02 = Warning Relay ON 0x03 = Both Relays ON
48	2	Returns Trouble Status (non-zero value indicates Trouble)
48	3	Returns maximum gas value
48	4	Returns gas value used during calibration
48	5	Returns IT-Series Model Number 0x28 = 5100-IT-28

Device Specific Commands

The Device Specific commands are used for accessing the unique features of the 5100-IT Series of gas sensor modules.

A response code of 0 indicates SUCCESS. This applies to all commands. As per HART specification, all command responses will have a response code and status byte, plus any command specific data bytes as indicated in the following tables.

Device Specific Commands Summary

Command Number	Description
130	Key Press
131	Set Alarm Level
132	Set Warning Level
133	Set Alarm Relay Action
134	Set Warning Relay Action
135	Reset Alarms
136	Abort Calibration
137	Set Calibration Gas Level
138	Apply ZERO Gas
139	Apply SPAN Gas
140	RESERVED
141	Force Gas Value
142	Reset Force Gas Value
143	Read MODBUS RTU Register
144	Set Transducer Serial Number
145	Set Calibration Mode output current
146	Set Trouble Mode output current
147	RESERVED
148	RESERVED
149	Set Gas Factor
150	Write MODBUS RTU Register

Command 130: Key Press

This command mimics the front plate key inputs.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	1=Enter 2=Down 4=Up 8=Menu

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns same value as passed

Command 131: Set Alarm Level

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Alarm level, range 0 to 60. Default is 60.

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Alarm Level.

Command 132: Set Warning Level

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Warning level, range 0 to 60. Default is 20.

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Warning Level.

Command 133: Set Alarm Relay Action

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	0=Latching (default) 2=Non-Latching

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Alarm Relay Action value

Command 134: Set Warning Relay Action

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	0=Latching 2=Non-Latching (default)

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Warning Relay Action value

Command 135: Reset Alarms

This command will reset any alarm relays that have been latched, providing the alarm condition is no longer present on the sensor.

Request Data Bytes: None

Command Specific Response Data Bytes: None

Command 136: Abort Calibration

This command aborts the calibration procedure.

Request Data Bytes: None

Command Specific Response Data Bytes: None

Command 137: Set Calibration Gas Level

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Calibration Gas Level, range 0 to 100

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Calibration Gas Level

Command 138: Apply ZERO Gas

This command will signal the module to accept the present sensor output to as the ZERO gas condition.

Request Data Bytes: None

Command Specific Response Data Bytes: None

Command 139: Apply SPAN Gas

This command will signal the module to accept the present sensor output to as the SPAN gas condition.

Request Data Bytes: None

Command Specific Response Data Bytes: None

Command 141: Force Gas Value

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Sets the Force Gas Value, range 0 to 100

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Force Gas Value

Command 142: Reset Force Gas Value

This command will signal the module to set the Force Gas Value to 0.

Request Data Bytes: None

Command Specific Response Data Bytes: None

Command 143: Read MODBUS RTU Register

This command allows the reading of sensor module data as defined in the MODBUS RTU register map.

Request Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Address of Requested Modbus Register 40001 = lowest address 65535 = highest address

Command Specific Response Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Returns contents of selected Modbus Register

Command 144: Set Transducer Serial Number

This command allows user to add a device specific serial number, if required. This is different from the serial number assigned by the Manufacturer.

Request Data Bytes:

Byte	Format	Description
0-2	Unsigned-24	Serial Number

Command Specific Response Data Bytes:

Byte	Format	Description
0-2	Unsigned-16	Returns new Serial Number

Command 145: Set Calibration Mode output current

Request Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Current output required during calibration, in micro-amperes

Command Specific Response Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Returns new Calibration current value

Command 146: Set Trouble Mode output current

Request Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Current output required to indicate Trouble, in micro-amperes

Command Specific Response Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Returns new Trouble current value

Command 149: Set Gas Factor

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Sets the Gas Factor value, range 30-200

Command Specific Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Returns new Gas Factor value

Command 150: Write MODBUS RTU Register

This command allows the writing of sensor module data as defined in the MODBUS RTU register map.

Request Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Address of Designated Modbus Register 40001 = lowest address 65535 = highest address
2-3	Unsigned-16	Data for Designated Modbus Register

Command Specific Response Data Bytes:

Byte	Format	Description
0-1	Unsigned-16	Returns MODBUS register value

8.7 APPENDIX G1: 5100-25-IT GAS SENSOR MODULE

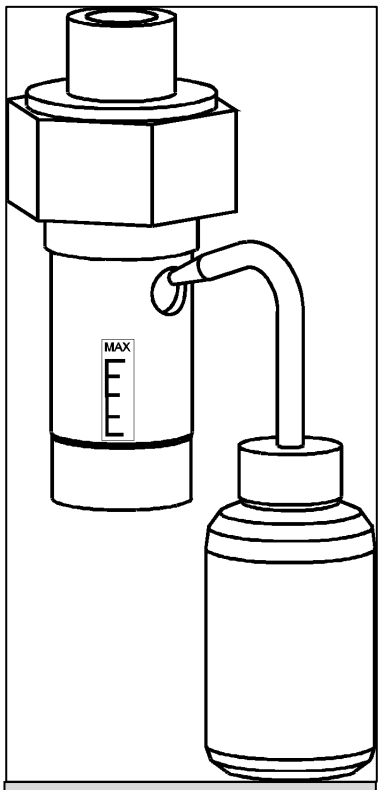


Figure 8 - 4: Module Components

1. Calibration of 5100-25-IT (Supplement to Instructions in Section 6)

2. Equipment Required

The following tools and equipment will be required for calibration:

- Permeation Device Calibrator (Model 9210-00), with Ammonia Permeation Tube (Model 9211-09).
- Calibration Adapter (Model 5358-01)

3. Permeation Device Calibrator Operation

The calibrator is a portable device with a pump that operates from a 1.5 V alkaline size D battery. A fresh battery should allow 8 hours of continuous operation. The permeation device will probably be shipped separately, usually in a pipe with screw cap ends, one of which will be marked for opening. The permeation device should come fitted with a scrubber, but, as a precaution, open the pipe and remove the permeation device in a well ventilated area.

1. Remove the scrubber from the permeation device and attach the device to the stainless steel "Tee" assembly inside the calibrator box. Tighten the connection with a wrench, with the device resting inside one of the openings in the rack.
2. Close the door of the calibrator and turn on the pump switch.
3. Set the flow rate for the desired ppm of ammonia. The desired flow rate for calibration of the Model 5100-25-IT is 300-500 cc/min. and the concentration range should be set between the high alarm point and 100 ppm full scale.

   The carrier gas flow rate can be calculated from the formula:

   $$P = (CxF)/K$$

   Where P = the permeation rate in nanograms/min., and C = ppm of span gas, F = carrier gas flow rate in ml./min. and K = 1.437 for ammonia. The permeation rate for the temperature read on the front of the calibrator can be obtained from permeation rate vs. temperature chart.
4. Run the gas calibrator for 30 min. before attaching the output hose to the ammonia sensor.
5. When the use of the calibrator is completed, do not turn off the pump unit until the permeation device has been removed from the "Tee" and the gas scrubber reattached. Failure to remove the permeation device when the pump has been turned off will contaminate the system with high amounts of the permeating gas and result in erroneous concentrations. The device, with scrubber, can be stored in the storage rack overnight, but should not stay in the gas calibrator for longer storage periods.

4. Sensor Assy. Rebuild Procedure

Follow procedures outlined in Electrolyte/Membrane Replacement (See Fig. 8-5)

The electrolyte needs to be replaced at least every six months, or if there is evidence of low sensor output. The membrane and O-Ring should be replaced at the same time that the electrolyte is replaced.

5. Equipment Required

- **Electrolyte Recharge Kit** (SPX27057 for Model 5100-25-IT and SPX27061 for Model 5100-26-IT) consisting of the electrolyte, package of 5 membranes, 5 0-Rings and alcohol wipes to clean the electrode.
- Tweezers to aid in removing and replacing the membrane

6. Preparation

a. Transfer the necessary electrolyte into a plastic wash bottle.

b. Confirm that system power has been removed.

c. Remove the transmitter electronics board from the main housing and unplug the sensor harness from the transmitter electronics.

d. Unscrew the sensor assembly from the bottom of the enclosure.

e. Remove the assembly cover from the sensor assembly.

CAUTION: Only remove the sensor cover from the assembly, DO NOT attempt to unscrew the sensor from the mounting assembly or you could damage the wiring.

7. Electrolyte Replacement (See Fig. 8-4)

a. Invert the sensor assembly so that the membrane is upward.

b. Insert the sensor assembly in a clamp, if available, and unscrew the box nut counterclockwise, and take out the hold-down ring, membrane and O-Ring. Then pour out the old electrolyte into a beaker for disposal.

CAUTION: Avoid contact of the electrolyte with skin, eyes and clothing. In case of contact wash immediately - rubber gloves and safety glasses are recommended.

c. Clean the electrode with the alcohol wipes included in the electrolyte replacement kit. All oxidation residue must be removed before re-assembly. When dirt is found inside the sensor assembly, wash the dirt off with electrolyte.

d. Hold the sensor assembly with the sensing electrode up. Close the pressure compensation port with a tissue. Pour approximately 10cc of fresh electrolyte from the wash bottle into the sensor, and rinse the inside of the sensor. Empty the electrolyte into the beaker.

e. Place the O-ring on top of the washer. Then transfer one drop of electrolyte from the plastic wash bottle to the exposed electrode surface.

f. Place a **new** membrane into the hold-down ring and carefully place the plastic hold-down ring on top of the sensor body with the ring ears in the slots of the sensor body. Then fasten the sensor cover over the assembly.

CAUTION: Never touch the membrane with your hands. Use rubber gloves or tweezers.

g. Invert the sensor so that the membrane is down. If this is the first time that electrolyte has been replace, there should be a round Mili Seal covering the pressure compensation screw. This Mili-Seal prevented loss of electrolyte during shipment. Remove and discard the round Mili Seal and remove the screw to expose the electrolyte supply port.

h. Transfer electrolyte from the plastic wash bottle into the electrolyte supply port (see Fig. 8-4) until the level is at the maximum level line on the side of the sensor body.

i. Replace the pressure compensation screw into the electrolyte supply port.

j. Replace the sensor housing cover.

k. Install the sensor assembly into the enclosure hub and tighten firmly.

l. Reconnect the sensor harness to the transmitter, carefully install the transmitter into the housing and restore system power.

m. Recalibrate the transmitter following the instructions in Section 6.

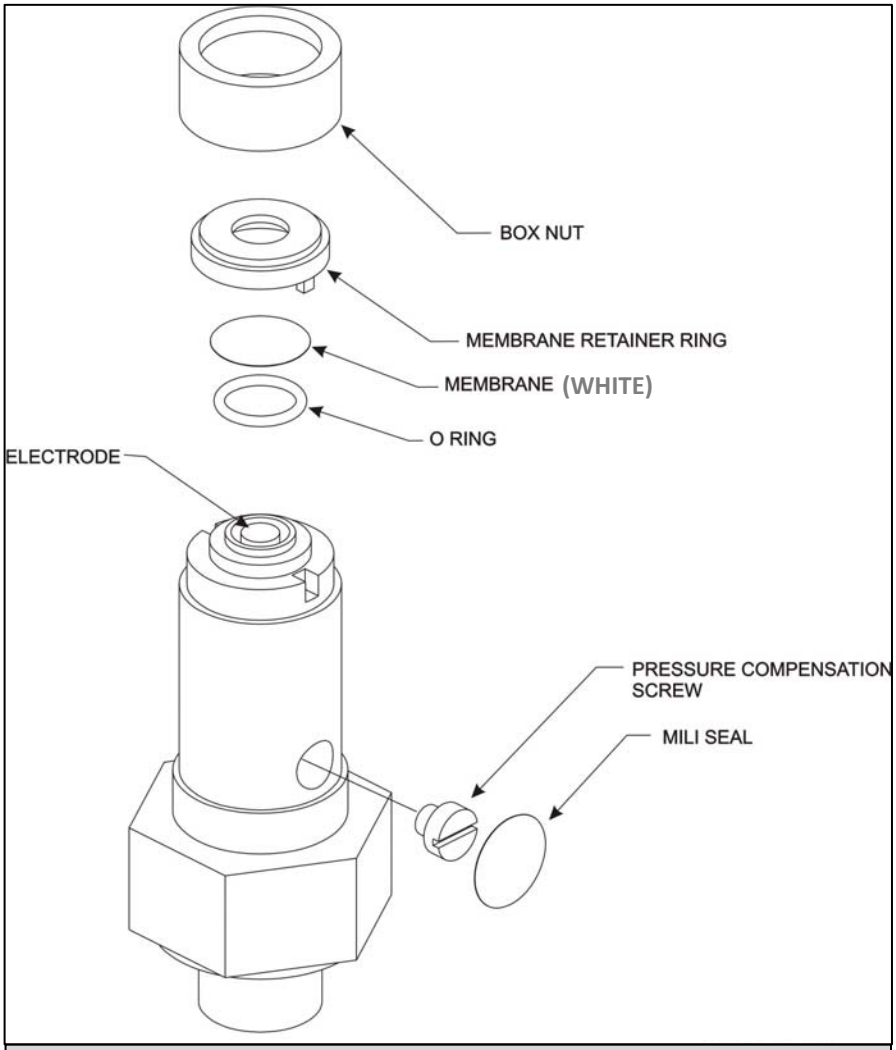


Figure 8 - 5: Sensor Assembly – Exploded View

Spare Parts

SPX27057	Recharge Kit NH3
SPX27061	Recharge Kit HF
SPX57009	Membrane Kit (both)
SPX99017	Electrolyte NH3
SPX99018	Electrolyte HF
5200-25-IT	Sensor Assy NH3
5200-26-IT	Sensor Assy HF

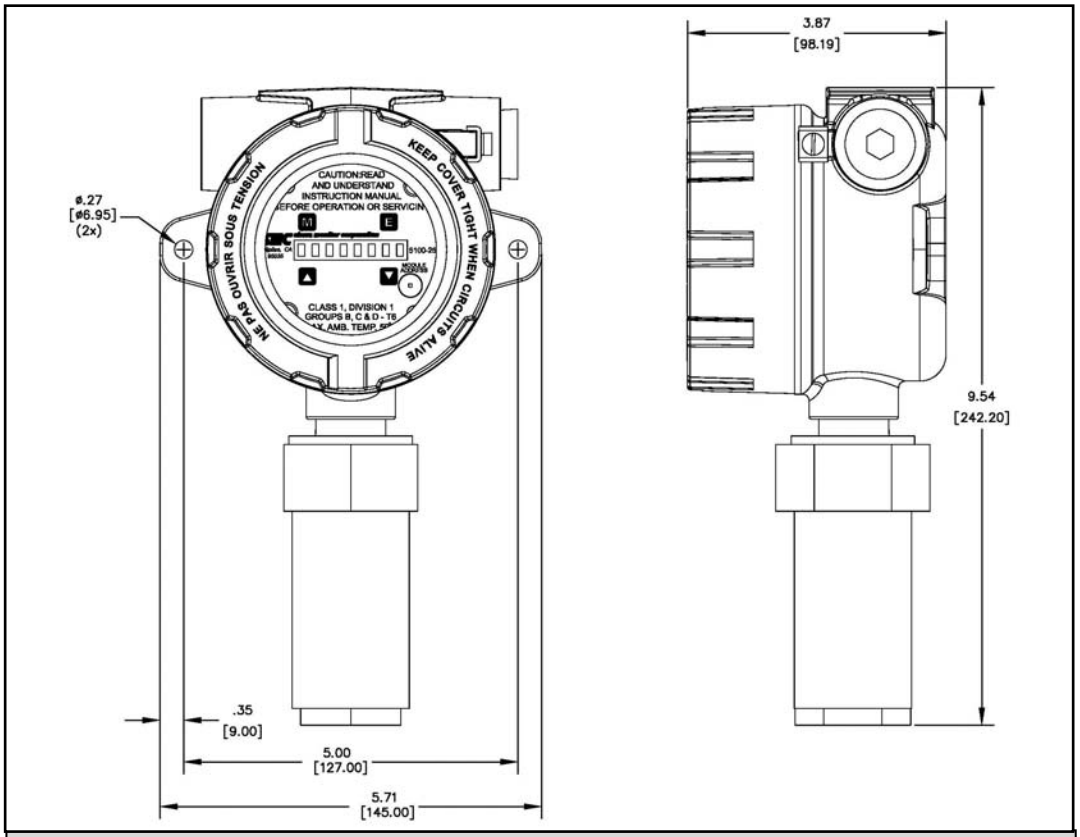


Figure 8 - 6: Model 5100-25-IT-A1 (& A2) and Model 5100-26-IT-A1 (& A2)

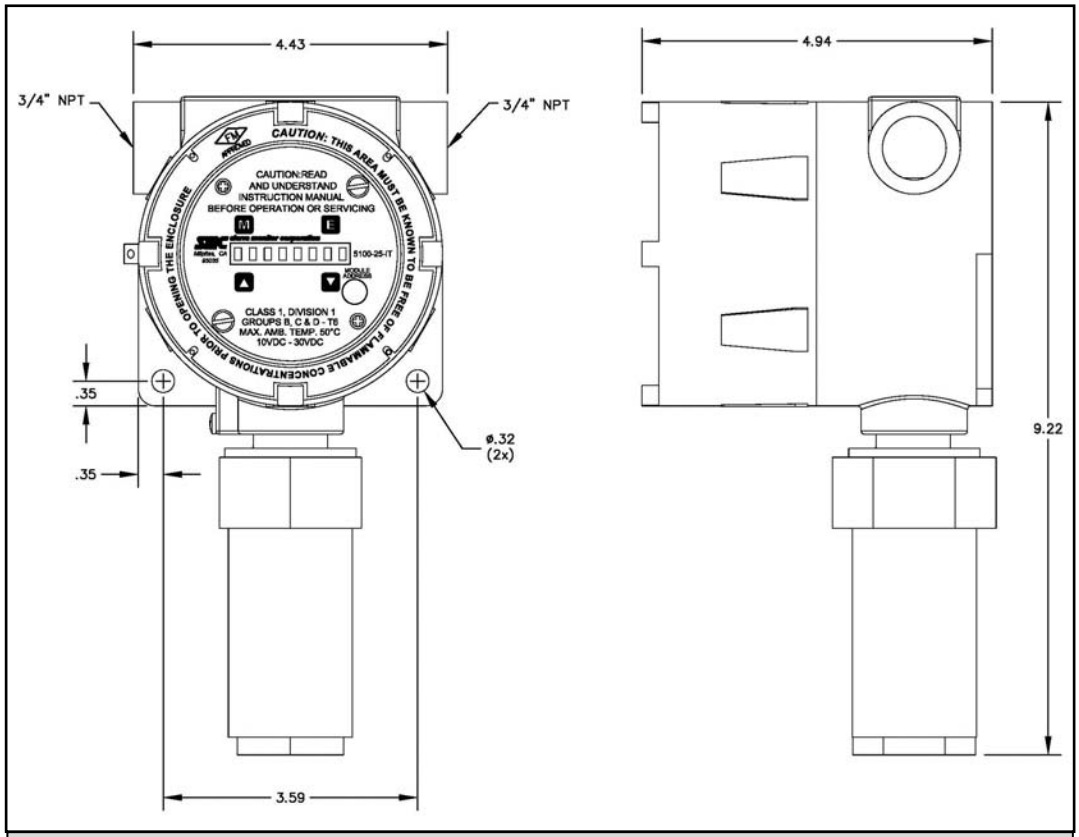


Figure 8 - 7: Model 5100-25-IT-S1 and Model 5100-26-IT-S1

8.8 APPENDIX G2: 5100-26-IT GAS SENSOR MODULE

Calibration of 5100-26-IT (Supplement to Instructions in Section 6)

1. The calibration of the Model # 5100-26-IT HF gas sensor module is accomplished by using a 5 ppm Chlorine standard (Type C kit with # 1260-06 cylinder). Scale range is 0-10 ppm with 5 ppm being mid-scale. 5 ppm Cl2 is equivalent to 5 ppm HF.
2. Reference Table 6.1 for the calibration procedure sub menu. This procedure requires the use of the magnetic wand to activate the keys and confirm each entry step. Follow prompts on the module display as navigation is detailed in Table 6.1
3. Enter actual span gas concentration that is printed on the cylinder being used when prompted.
4. Refer to the sensor rebuild and electrolyte replacement procedure as detailed in Appendix G1.

8.9 APPENDIX H: 5100-88-IT Dimensions

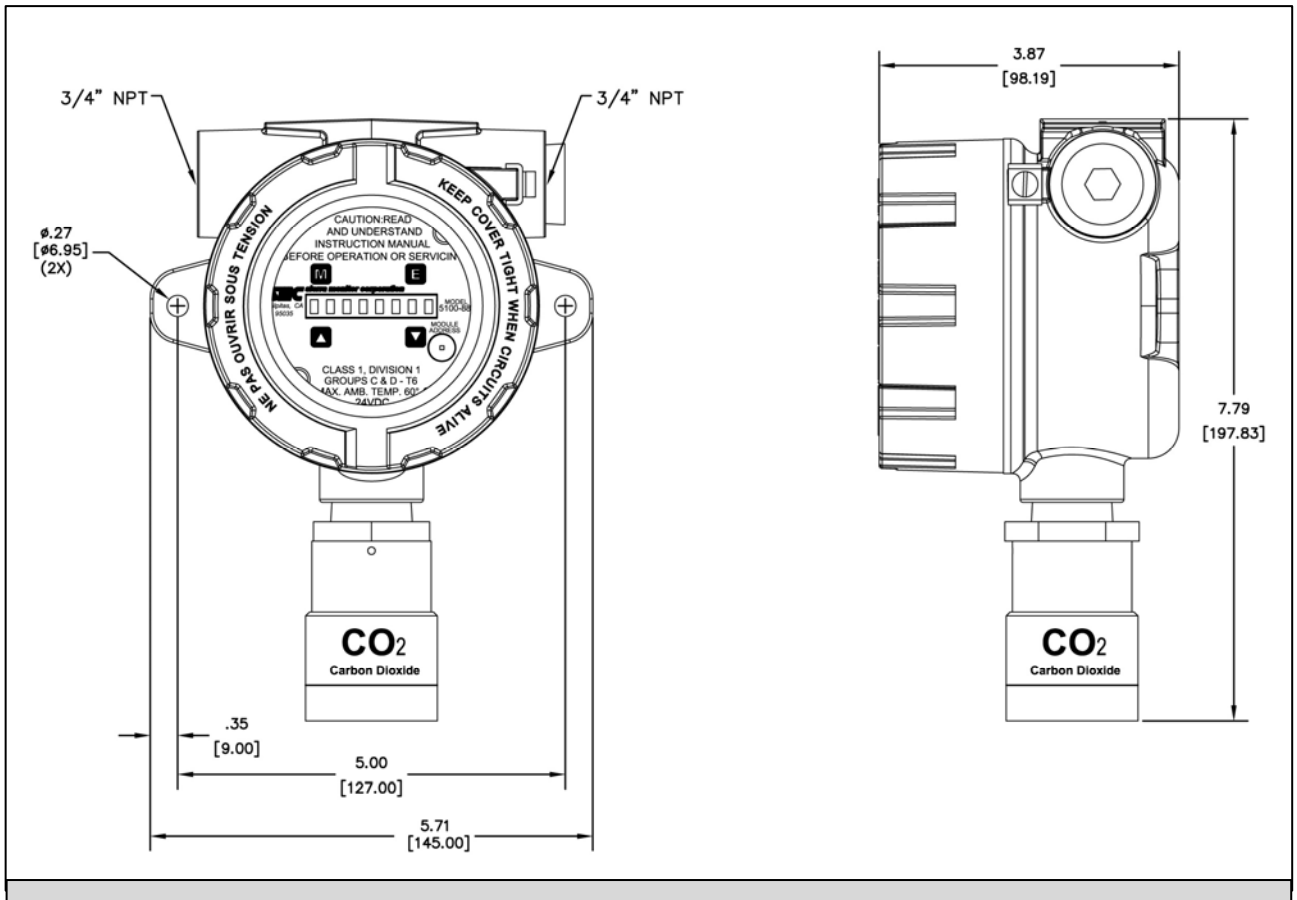


Figure 8 - 8: Model 5100-88-IT-A1 Dimensions

8.10 APPENDIX I: 5100-05-IT FM PERFORMANCE APPROVAL

FM Approvals
Member of the FM Global Group

FM Approvals
1151 Boston Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: **781 762 4300** F: 781-762-9375 www.fmapprovals.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

LOW CONCENTRATION (PPM) GAS DETECTORS, Fixed and Portable

Stationary Single Channel 4-20mA Toxics Gas Detector. Stand-alone Sensor/Transmitter 5100-05-IT Electrochemical Gas Detector and Remote Display option are explosionproof for installation in Class I, Division 1, Groups B, C and D, T6 and flameproof for installation in Class I, Zone 1, Ex d IIB+H_2, T6 Hazardous Locations. Model 5100-05-IT Sensor/Transmitter monitors 0-100 PPM hydrogen sulfide gas-in-air atmospheres. The instrument provides an eight character measurement display with magnetically coupled control functions, a 4-20mA measurement signal or RS-485 Modbus RTU communication, relay contacts, and low and high alarms. The optional Remote Display allows for locating the sensor up to 25 feet from the transmitter. The transmitter is Approved to interface to the Sierra Monitor Model 5000 Gas detection control unit. The transmitter and sensor assemblies are constructed of aluminum or stainless steel. The operating temperature range of the apparatus is -20°C to +50°C and operating voltage is 24 Vdc (nominal), 2 watts nominal power. The following accessories are Approved for use with the 5100-05-IT Sensor/Transmitter:

Model	Description
1250-01	Gas Sensor Calibrator Kit, Type A (w/o gas cylinders)
1256-01	Regulator Type A Calibrator
5358-01	Calibration Adapter - Direct, Standard
5358-50	Calibration/Configuration Magnetic Tool

5100-a-IT-b-c

a = Gas Type: 05
b = Enclosure: Al or SS
c = I/O: 01 or 02

Specifications – The manufacturer's specifications are as follows:

Range	0 – 100 PPM
Operating Temperature	-20°C to +50°C
Relative Humidity	5 to 99% RH
Supply Voltage	10 – 30 Vdc
Step Response	Rise to 90% of Full Scale within 30 seconds
Measurement Signal	4-20 mA
Calibration	Magnetic switch

FM Approved for:

Sierra Monitor Corporation
1991 Tarob Court
Milpitas, CA 95035

3033266C
Page 1 of 2

FM Approvals
Member of the FM Global Group

This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

C22.2 No. 0.4	1999
C22.2 No. 0.5	1999
C22.2 No. 30	2003
C22.2 No. 1010.1	2004
CAN/CSA E60079-0	2006
CAN/CSA E60079-1	2006

Original Project ID: 3033266C Approval Granted: February 7, 2011

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date

FM Approvals LLC

J. E. Marquedant
Group Manager, Electrical

8 February 2011
Date

3033266C
Page 2 of 2

8.11 APPENDIX J: 5100-XX-IT SIL-2 CERTIFICATES

Our SIL-2 Certificates for the 5100-04-IT, the 5100-05-IT and the 5100-06-IT can be found on our website at:

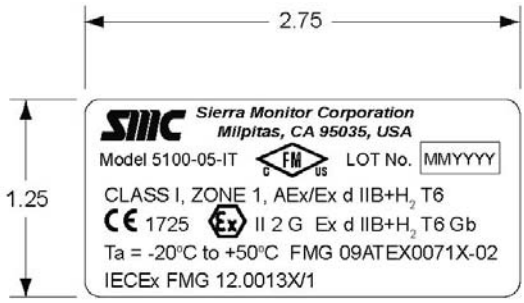
http://www.sierramonitor.com/gas/support/downloads.php

8.12 APPENDIX K: 5100-05-IT ATEX CERTIFICATE

THIS DRAWING AND SPECIFICATIONS ARE THE SOLE PROPERTY OF SIERRA MONITOR CORPORATION AND SHALL NOT BE USED IN WHOLE OR IN PART AS THE BASIS FOR MANUFACTURE OR SALE OF ITEMS WITHOUT WRITTEN PERMISSION OF SIERRA MONITOR CORPORATION.

REVISIONS

REV	DESCRIPTION	BY	DATE	APPV
A	RELEASED PER DCN 1305	MN	4/26/12	MF
A1	REV PER DCN 1475	YN	7/31/12	MF
A2	REV PER ECN 3232	YN	3/27/13	MF
A3	REV PER ECN 3232	YN	9/2/14	MF


2.75
1.25
Sierra Monitor Corporation
Milpitas, CA 95035, USA
Model 5100-05-IT
LOT No. MMYYYY
CLASS I, ZONE 1, AEx/Ex d IIB+H2 T6
1725 II 2 G Ex d IIB+H2 T6 Gb
Ta = -20°C to +50°C FMG 09ATEX0071X-02
IECEx FMG 12.0013X/1

NOTES: UNLESS OTHERWISE SPECIFIED:

1. MATERIAL:
   a) WHITE POLYESTER (SMC P/N 35974).
   b) LABELS SHALL BE MADE USING UL APPROVED MATERIALS AND PROCESSES.
2. FINISH: BLACK TEXT ON WHITE BACKGROUND.
3. DATE CODE: MMYYYY (MM = MONTH, YYYY = YEAR).
4. APPLY THIS LABEL TO THE OUTSIDE OF THE INSTRUMENT HOUSING AS SHOWN ON THE APPROPRIATE ASSEMBLY DRAWING.

THIS DRAWING AND SPECIFICATIONS SHALL NOT BE CHANGED WITHOUT WRITTEN APPROVAL FROM FACTORY MUTUAL (FM APPROVALS).

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
.XX .01
.XXX .005

MATERIAL:
SEE NOTE 1

FINISH:
SEE NOTE 2

DISK #: SERIES H
FILE #: H35452-A3.AI

APPROVALS	DATE
DWN M NGUYEN	10/20/10
CHK	
ENG S PARAMASIVAM	5/18/11
OPS M FARR	5/24/11
MKT	

sierra monitor corporation
(408) 262-6611

MODEL 5100-05-IT
ARTWORK, ATEX/CE MARKING LABEL

SIZE	DWG NO.	REV
A	H35452	A3

SCALE 1:1 | DO NOT SCALE DRAWING | SHEET 1 OF 1

FORM: ANSI-A-V.AI REV-A

1 EC-TYPE EXAMINATION CERTIFICATE

2 **Equipment or Protective systems intended for use in Potentially Explosive Atmospheres - Directive 94/9/EC**

3 **EC-Type Examination Certificate No:** **FM09ATEX0071X**

4 **Equipment or protective system: (Type Reference and Name)** **Model 5100-05-IT Hydrogen Sulfide Gas Sensor Module**

5 **Name of Applicant:** **Sierra Monitor Corporation**

6 **Address of Applicant:** **1991 Tarob Court**
Milipitas, CA 95035
USA

7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and documents therein referred to.

8 FM Approvals Ltd, notified body number 1725 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report number:

3033266EC dated 7 February 2011

9 Compliance with the Essential Health and Safety Requirements, with the exception of those identified in item 15 of the schedule to this certificate, has been assessed by compliance with the following documents:

EN60079-0: 2009 and EN60079-1: 2007

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC-Type Examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include:

II 2 G Ex d IIB+H2 T6 Gb Ta = -20°C to +50°C

Digitally signed by Andrew Was
DN: cn=Andrew Was, o=FM Approvals, ou=Certification Manager, email=andrew.was@fmapprovals.com, c=GB
Date: 2011.02.23 21:02:26 Z

Andrew Was
Certification Manager, FM Approvals Ltd.

Issue date: 23rd February 2011

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals Ltd. 1 Windsor Dials, Windsor, Berkshire, UK. SL4 1RS
T: +44 (0) 1753 750 000 F: +44 (0) 1753 868 700 E-mail: atex@fmapprovals.com www.fmapprovals.com

SCHEDULE

to EC-Type Examination Certificate No. FM09ATEX0071X

13 **Description of Equipment or Protective System:**

General - The Model 5100-05-IT Hydrogen Sulfide Gas Sensor Module is a self-contained gas detection assembly which can function as a standalone gas detector using an integral sensor. The device operates on 24 Vdc nominal (10-30 Vdc range) with a 4-20 mA output measurement signal. The ambient operating temperature of the device is -20°C to +50°C.

Construction - The Model 5100-05-IT Hydrogen Sulfide Gas Sensor Module consists of an aluminum or stainless steel electronics enclosure assembly which contains the display, interface and communications electronics connected to an aluminum or stainless steel gas sensing sub-assembly (A21830 or A27074) which contains an electrochemical hydrogen sulfide gas sensing cell, sensor electronics and the sensor transmitter board. The aluminum (A21830) or stainless steel (A27074) sensor enclosure assembly contains a male-threaded NPT nipple and a sintered flame arresting element press fit into place. The sensor assembly contains a threaded joint between the top and bottom portions and a cemented joint in the neck of the threaded male NPT connection. The sensor housing has an approximate free internal volume of 10 cm^3. The aluminum or stainless steel electronics enclosure is manufactured by International Metal Engineering, Model 8092WM-07 (aluminum) or Model 8092SM-07 (stainless steel) which are ATEX certified under certificate number SIRA08ATEX1082U for use in Gases (II 2 G) Ex d IIC Ta = -40°C to +85°C, IP66.

5100-a-IT-b-c. Hydrogen Sulfide Gas Sensor Module.
a = Gas Type: 05.
b = Enclosure: Al or SS.
c = I/O: 01 or 02.

14 **Special Conditions for Safe Use:**

Contact the original manufacturer for information on the dimensions of the flameproof joints.

15 **Essential Health and Safety Requirements:**

The relevant EHSRs that have not been addressed by the standards listed in this certificate have been identified and assessed in the confidential report identified in item 8.

16 **Test and Assessment Procedure and Conditions:**

This EC-Type Examination Certificate is the result of testing of a sample of the product submitted, in accordance with the provisions of the relevant specific standard(s), and assessment of supporting documentation. It does not imply an assessment of the whole production.

Whilst this certificate may be used in support of a manufacturer's claim for CE Marking, FM Approvals Ltd accepts no responsibility for the compliance of the equipment against all applicable Directives in all applications.

This Certificate has been issued in accordance with FM Approvals Ltd's ATEX Certification Scheme.

17 **Approved Drawings**

Details of the approved drawings and documents are identified in the confidential report identified in item 8.

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

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